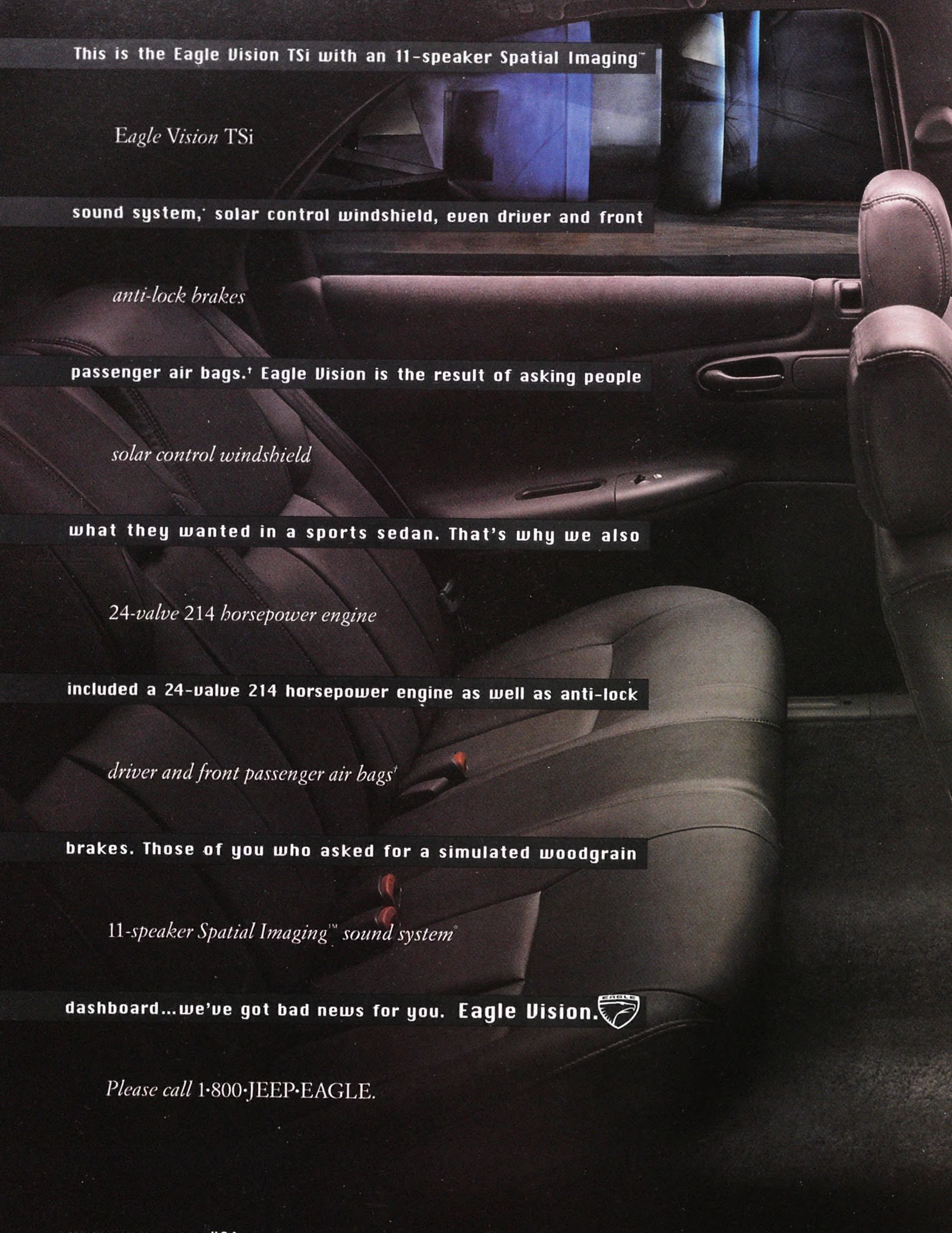
Smithsonian

June 1994

MOUNTAIN BIKES

Cruising the crest of the craze (p. 74)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June 1994

Smithsonian

Volume 25, Number 3

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Photograph by Gerry Gropp

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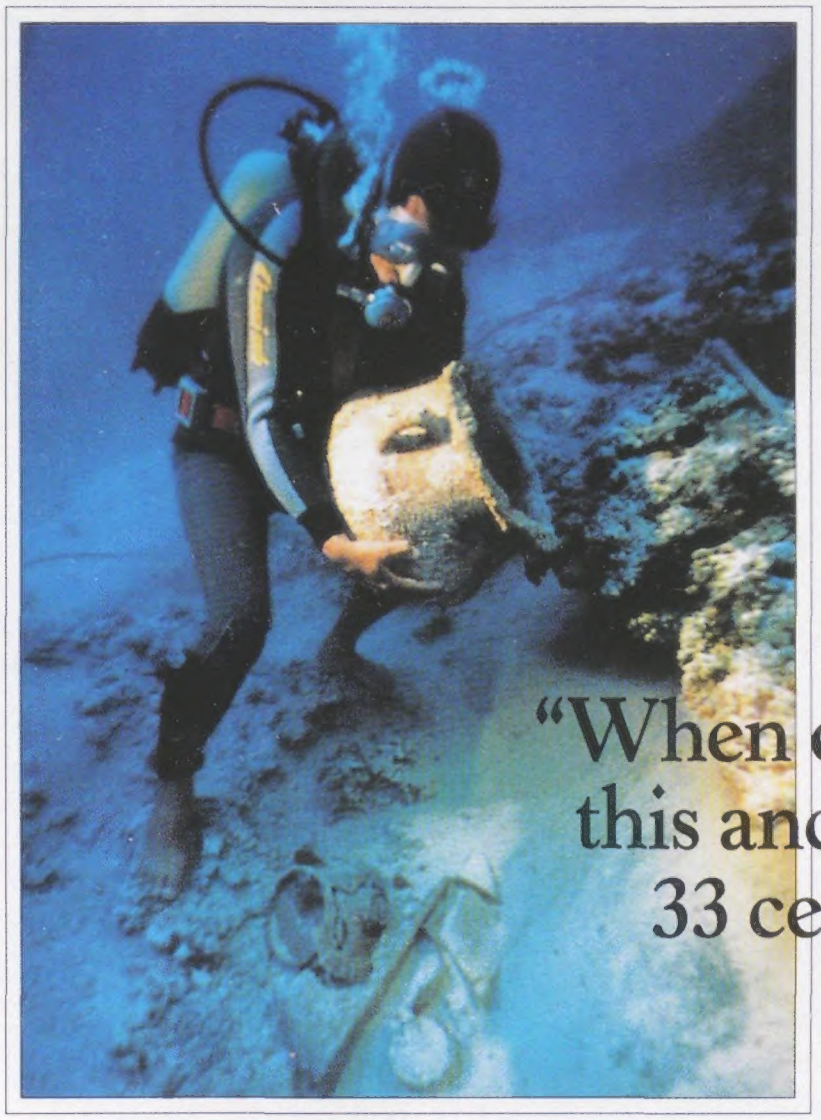

Archaeologist recovering terra-cotta pot at 170 feet.

Some time around 1300 B.C., a Bronze Age trading vessel sank off the Turkish coast at Ulu Burun.

Today it lies 150 to 180 feet below the surface of the Mediterranean, protected from marine worms by layers of mud and sand.

Marine archaeologist George F. Bass has been diving for shipwrecks for 30 years, but none is more important than this trader—the oldest known wreck in the world.

Site of Bronze Age shipwreck off the coast of modern-day Turkey.

Probing ever deeper into the 3,300-year-old ship, divers uncovered artifacts at every layer. "Each successive discovery is a tiny window to the past," says Bass. "By studying and protecting these antiquities, we can learn a great deal about the civilizations that created them." As the success of the expedition depends

Dr. George Bass, expedition leader.

"When exploring the remains of this ancient shipwreck, I travel 33 centuries back in time."

Dr. George Bass

in large part on safe decompression-diving principles, he restricts himself and the dive team to a maximum of 20 minutes elapsed bottom time.

Accordingly, Dr. Bass times every dive he makes with his Rolex Oyster Perpetual Submariner. At depths of 150 feet, water pressure poses no problem for a timepiece that is perfectly at home 1,000 feet below the surface. The massively strong Oyster case, synthetic sapphire crystal, and Triplock winding crown combine to produce a virtually indestructible shell, making Rolex a natural companion for Dr. Bass on his travel through time.

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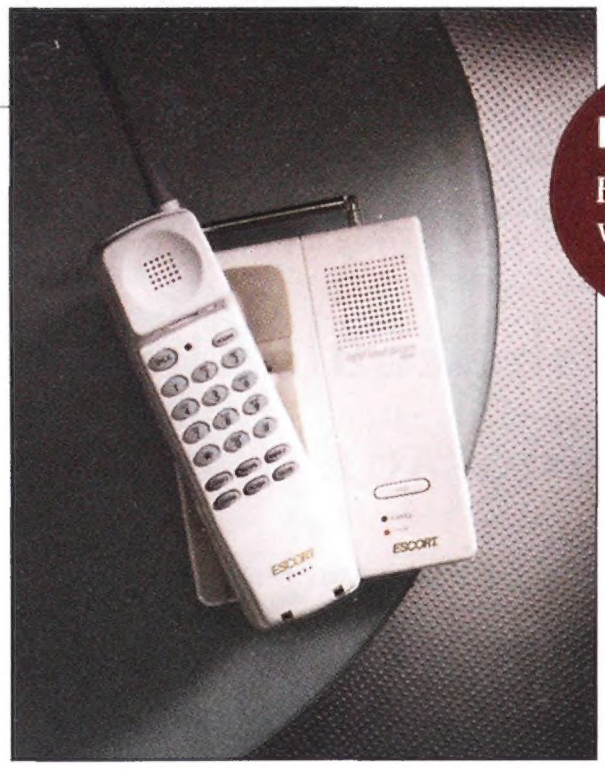

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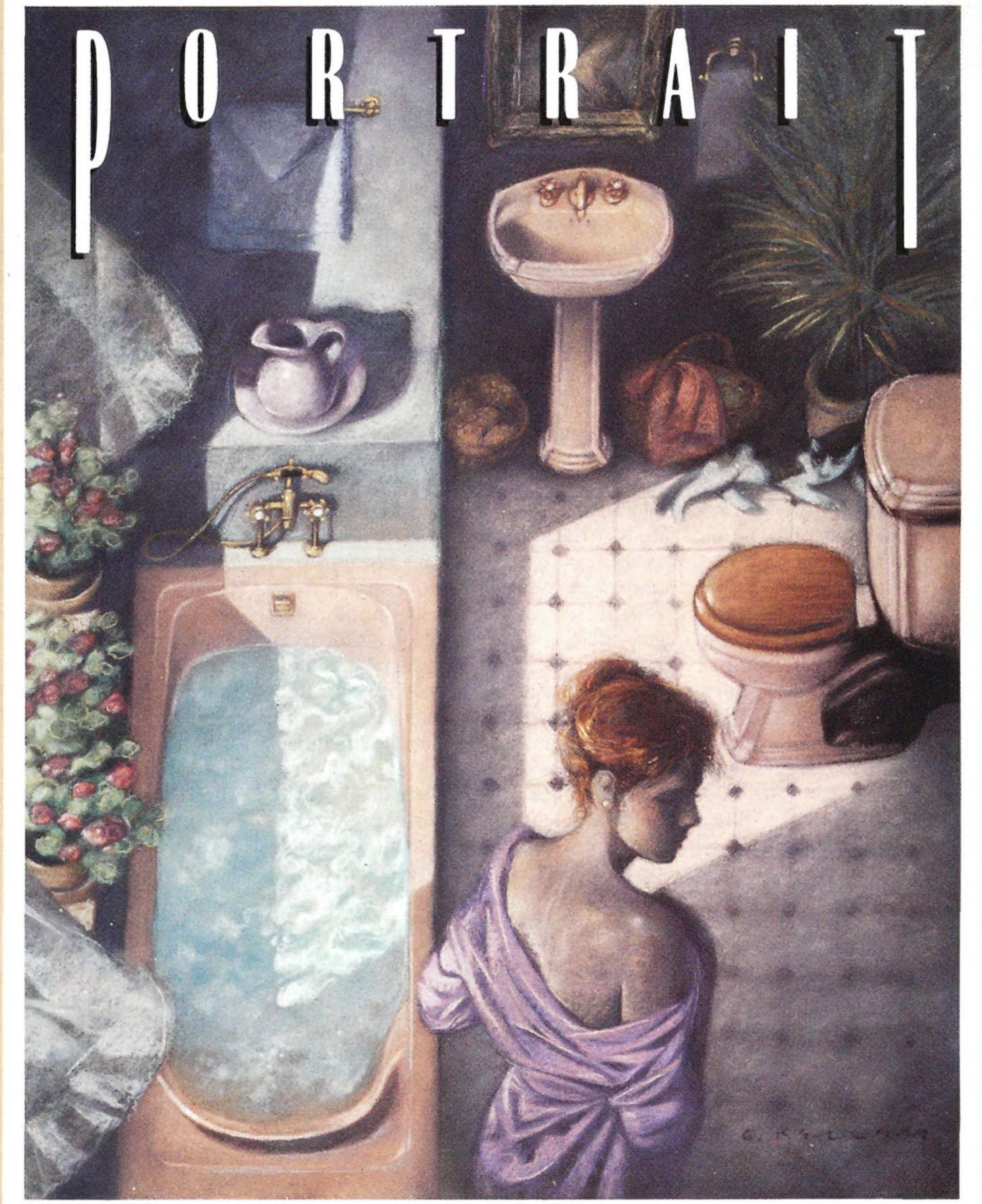

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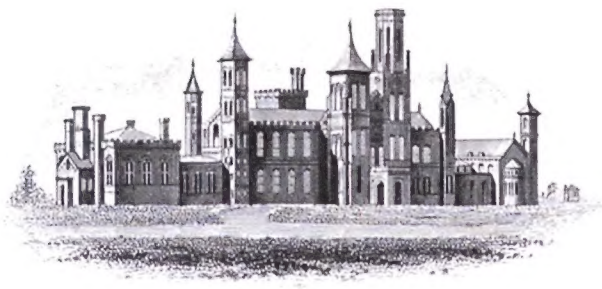


Building bridges between science and the public: a new Smithsonian exhibit, "Science in American Life"

A major new exhibit entitled "Science in American Life" opened in April at the National Museum of American History. Five years in planning and preparation, it has been supported by a generous grant from the American Chemical Society in the interests of public education. Adjoining and complementing it is our exhibit on the Information Age, another major, fairly recent effort that is also permanent. With the two, the Smithsonian seriously comes to grips with the historical development of modern science and technology.

As implied by the title, the exhibit is something more than a simple display of the salient accomplishments of science over the past century or so. It is a view of science that takes into account perceptions of the general public as well as of scientists. We hope it will be a bridge that embeds science more fully in American culture. It attempts to introduce to their fellow citizens some of the people who have played a significant part in advancing science, providing explanations of what they did and thought. Incorporating a hands-on section where the public can engage in experiments under the tutelage of laboratory technicians, it creates a setting that we are confident will turn at least a few young visitors toward scientific careers.

Museums are built around collections of objects, and this exhibit contains some exciting and important ones. Among its objectives, however, is the building of another kind of bridge–between newly invented objects or laboratory paraphernalia and the deeper, more intangible essence of science. Ultimately this lies not so much in material findings as in the realm of long-sustained inquiry and the ideas that organize and stimulate it.

Science is the discovery of laws, patterns, new insights, the disciplined testing of hypotheses. But it is also the quest for simplicity, knowing that the way may lead instead into new realms of complexity: the recognition of contingency and of the elusiveness of certainty; the readiness to accept contrary findings, and the eagerness to entertain a fresh perspective or engage the holder of a reasoned, contrary opinion. "Our present business is not to exchange compliments but arguments," said chemist Robert Boyle more than three centuries ago.

What part of science is directly linked to improvements in American well-being? Some benefits–advances in the medical sciences, and many products of the microelectronics revolution–come immediately to mind. Saccharin and nylon are among the major chemical examples with which the exhibit deals.

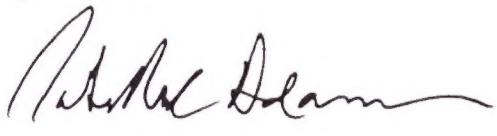
But the central core of science is basic and curiosity-driven, not immediately concerned with practical outcomes or products. Still, widening the horizons of general knowledge is surely a public good as well as a scientific objective. And since knowledge can never be compartmentalized, there can be few significant additions to its corpus that are not ultimately incorporated in some contribution to the common good. Not infrequently, in fact, new applied research or technological achievements turn up puzzles that would never be directly encountered in nature, thus leading to basic discoveries. And vice versa, as was the case with saccharin.

Here is another bridge for the exhibit to build. At one end are the multiplicities of close and remote leads and bodies of existing knowledge that most scientific enterprises draw upon. Often the paths to new discoveries are circuitous and little more than intuitive, and only later, after refinement, do they seem simple and even obvious. At the other end are the popular perceptions of science as a linear, smoothly unbroken chain of successes.

Still another bridge seeks to connect the diverse community of scientists with the lives and concerns in other American communities. What are the reward systems of the scientific community? How does this one manage to recruit and train young scholars and scientists from among the "best and the brightest" in order to replenish itself? To what extent is it transgenerational? What are its shared values and recognized hierarchies? How strong are the disciplinary barriers within it? What is its tolerance for dissent and heterodoxy? How did it first find shelter in universities (Johns Hopkins in 1870s Baltimore is a fitting focus of one gallery), and how does that relationship fare today?

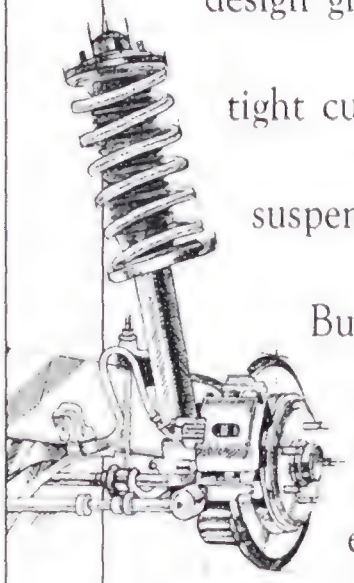
What (if anything) is peculiarly American in "American science"? Are there national styles, values or traditions even in this specialized community, so that here it has grown up around activities and principles different from those elsewhere? How do such traditions intersect with the international orientation that is at the heart of all science?

You should understand that these are my questions. The exhibit has its own story to tell and does not directly ask or answer any of them. But that is what exhibits do best: stimulate tangential lines of thought and provoke questions. The National Museum of American History is itself a bridge-builder. We need a lot more bridges built to hold American society together and to move it forward.



Like most New Yorkers, this one is sophisticated, refined and definitely has an attitude.

Underneath its graceful curves and quiet ride, its glove leather-trimmed seating* for six and sophisticated sound system, what you have here is anything but your basic mild-mannered luxury sedan. It's a New Yorker. And unlike other full-size luxury cars that float and wallow down the highway, this one cuts a swath. Its "cab forward" design gives it a cavernous interior and a wide track for rock-solid stability around tight curves. It also has four-wheel disc anti-lock brakes and a fully independent suspension. It's a car that will be looked at, admired, and at times, even a little envied.



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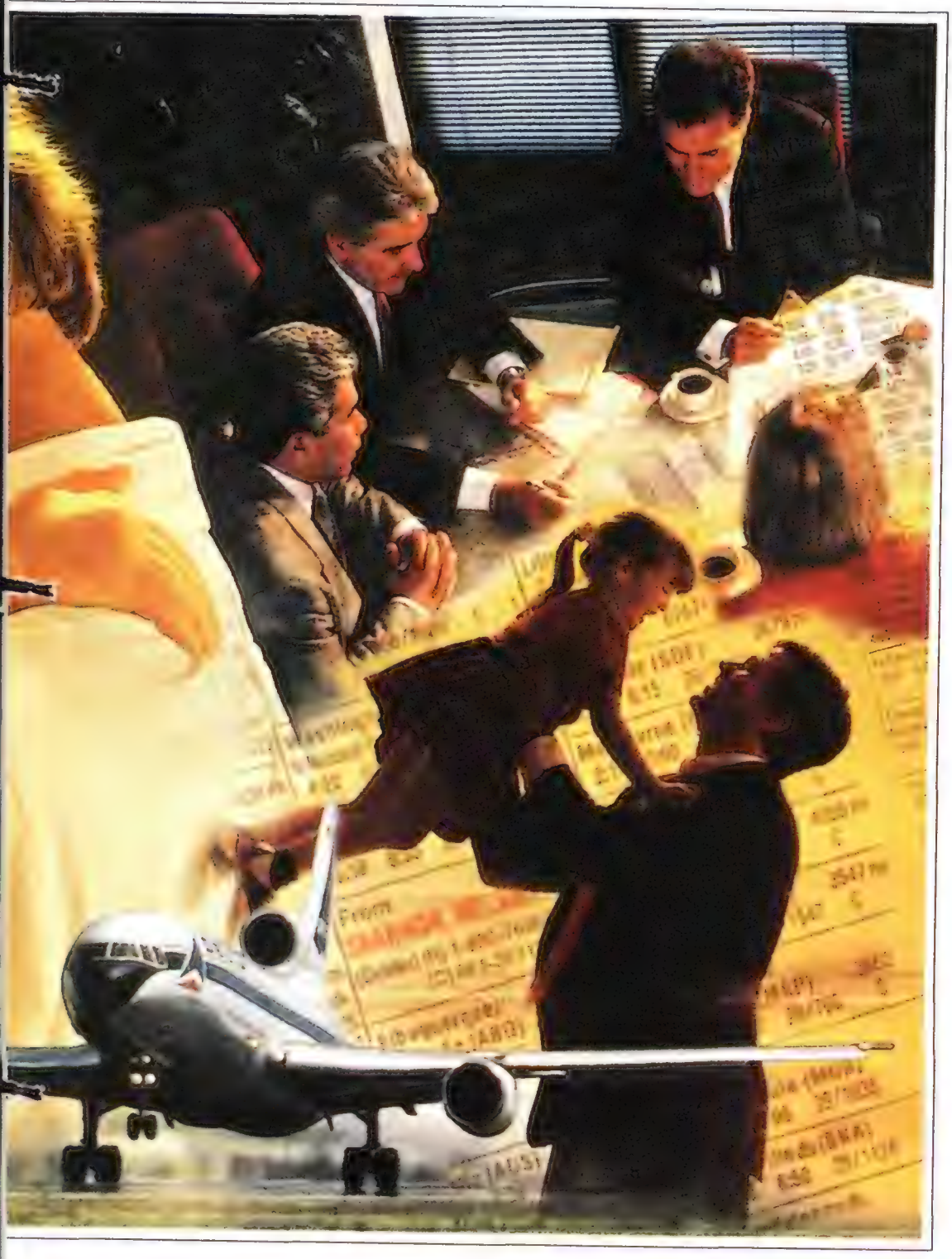

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Letters to the Editor

The object at hand

Dear Sir: Regarding your April article, so many well-meaning Americans misunderstand or choose to misunderstand the Confederate flag. It is not a racial symbol; it is a flag from a tragic time in our history.
Robert W. Pridgen
Norlina, North Carolina

Dear Sir: It is important to understand that the Confederate flag represents to African-Americans and people of goodwill what the swastika represents to Jewish people. It represents horrible crimes against humanity, as well as rebellion against unity, parity and integration.

No one is trying to erase the Confederacy from the annals of history, but its symbols should be honored in museums or other places where history belongs. Using the flag today, particularly in an official capacity, sends a negative message that hatred and white supremacy continue to live in the hearts of Americans and to get official sanction.
State Senator Ralph David Abernathy III
Atlanta, Georgia

Dear Sir: Born in Tennessee and growing up in southern Kentucky, I was taught by my father and by the schools I attended that the flag was not intended to represent the institution of slavery, racism or white supremacy. During the Civil War only about 10 percent of Confederate soldiers and only 25 percent of all Southerners owned slaves. It is wrong for white supremacists and other racist groups to use this emblem of the South.

To me, it is a symbol of my culture and a tribute to those who died for it. Therefore, I see no difference between my flying my Southern flag and the African-American community flying its red, green and black flag or wearing the Malcolm X symbol on hats and shirts to honor its culture.
Jason Lovelace
Olathe, Kansas

Dear Sir: My mother's people in Missouri lost two sons in that war. My father's people in Georgia, through whose farm Sherman's army marched, lost two sons and a son-in-law. They owned no slaves, nor did most men who fought under that banner. They fought not to protect the rights of slaveholders, nor the institution of slavery, but to preserve their right to be free and independent and to protect their lands.
Julius M. Johnson
Toccoa, Georgia

Dear Sir: This flag is a reverent remembrance of the thousands who died for a cause in which they earnestly believed.

I cannot imagine anyone in his or her right mind giving credence to the likes of the KKK, skinheads, neo-Nazis or any other brainless endeavor "using" the Confederate flag. It is an honorable emblem that has nothing whatsoever to do with their ilk–not a symbol of racism, no matter who sees it in that light.
Virginia H. Sollers Hoffmaster
United Daughters of the Confederacy
Baltimore Chapter Number 8
Baltimore, Maryland

Dear Sir: To simplify the issues that divided North from South into slavery and racism is ridiculous. More than anything, economics sparked the conflict. Ponder the emotional impact of the word "racist." Besides being overworked, it is divisive. How much longer must we drive wedges between segments of our society? I suggest we warmly cherish our cultures and heritages, which, blended together, make us Americans.
Lewis C. Prince
Sulphur Springs, Arkansas

Garbage House

Dear Sir: Using recycled products in new-home construction is indeed an idea whose time has come, but we'd get there a lot faster if designers and builders of public and commercial buildings used by so many took up the gauntlet.

This kind of leadership has been exhibited in High Point, North Carolina, by the Piedmont Environmental Center, a nonprofit educational institution funded by county, city, corporations and individuals. Its new 6,800-foot facility is built largely with recycled materials and environmentally friendly products, including office carpeting made from old ketchup bottles (naturally stain resistant); restroom tiles from ground automobile windshields; roofing tiles from cement, newspapers and beverage cans; bricks and wood flooring from old mills. Impressive and fascinating.

The building itself is an educational exhibit: the more exposure, the more demand; the more availability, the lower the cost, the more demand. An environmental loop we'd all like to be in!
Martha W. Millard
High Point, North Carolina

Clouds

Dear Sir: The lenticular clouds in this picture [below], which are a rare occurrence, drifted from the tops of the Olympic Mountains and out over the Strait of Juan de Fuca in November 1992.
Gordon R. McDonald
Sequim, Washington

Dear Sir: Between 1892 and 1899 Claude Debussy wrote "Nuages," exquisitely describing his love affair with clouds.

Debussy did not like his music analyzed and would never have stood still for an interpretation of his beautiful music as stratus, cumulus, cirrus or nimbus. "When you tear the wings off a butterfly, it is no longer a butterfly," he once said.
Norman C. Chapman
Calabasas, California

Dear Sir: I have flown military and civilian aircraft for 43 years: supersonic fighters over North Vietnam, the Mach 2+ F-4, and for the past 20 years Cessnas for

Every man over 50 should take this

PROSTATE TEST

Please answer the following questions:

YES NO

- ☐ ☐ Do you urinate often, especially during the night?
- ☐ ☐ Do you have trouble starting your urine stream?
- ☐ ☐ Do you have a weak or interrupted urine stream?
- ☐ ☐ Does it feel like your bladder isn't emptying completely?

Please detach and take to your doctor.

If you answered "yes" to any question, you should see your doctor. You may be experiencing the symptoms of a condition called benign prostatic hyperplasia (BPH), which is an enlargement of the prostate gland.

Affecting one out of three men over the age of 50, symptomatic BPH can be caused by a *tightening* of muscles inside the prostate. These tightened muscles can slow the flow of urine, leading to the kinds of urinary symptoms described above.

There are three basic treatment options for symptomatic BPH: "watchful waiting," which entails having regular checkups over time; surgery; and medication.

HYTRIN: A New Treatment Option

HYTRIN is a once-a-day medication that can rapidly treat bothersome BPH symptoms. HYTRIN works by *relaxing* the muscles that have tightened in the prostate, increasing urine flow and decreasing urinary symptoms. With HYTRIN, you can see improvement in 2 to 4 weeks.

HYTRIN can cause a sudden drop in blood pressure at the beginning of treatment (or if you miss doses and then start taking the medication again). You may feel dizzy, faint, or "light-headed," particularly after getting up from a chair or bed.

If you have any urinary symptoms, see your doctor. Only your doctor can properly diagnose symptomatic BPH (or other conditions such as prostate cancer).

And, only your doctor can treat your bothersome BPH symptoms with HYTRIN. *For FREE information on symptomatic BPH and HYTRIN, please call* **1-800-447-1116**

Please see patient information on adjacent page.

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PATIENT INFORMATION ABOUT HYTRIN® (HI-TRIN)

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hydrochloride

When used to treat
BENIGN PROSTATIC
HYPERPLASIA (BPH)

Please read this leaflet before you start taking HYTRIN. Also, read it each time you get a new prescription. This information should NOT take the place of a full discussion with your doctor. You and your doctor should discuss HYTRIN and your condition before you start taking it and at your regular check-ups.

HYTRIN is used to treat benign prostatic hyperplasia or BPH. HYTRIN is also used to treat high blood pressure (hypertension). This leaflet describes HYTRIN only as a treatment for BPH.

What is BPH?

The prostate is a gland located below the bladder. It surrounds the urethra (you-REETH-rah), which is a tube that drains urine from the bladder. BPH is an enlargement of the prostate gland. The symptoms of BPH, however, can be caused by an increase in the tightness of muscles in the prostate. If the muscles inside the prostate tighten, they can squeeze the urethra and slow the flow of urine. This can lead to symptoms such as:

- a weak or interrupted stream when urinating
- a feeling that you cannot empty your bladder completely
- a feeling of delay when you start to urinate
- a need to urinate often, especially at night, or
- a feeling that you must urinate right away.

Treatment options for BPH

There are three main treatment options for BPH:

- Program of monitoring or "Watchful Waiting". Some men have an enlarged prostate gland, but no symptoms, or symptoms that are not bothersome. If this applies, you and your doctor may decide on a program of monitoring including regular check-ups, instead of medication or surgery.
- Medication. There are different kinds of medication used to treat BPH. Your doctor has prescribed HYTRIN for you. See "What HYTRIN does" below.
- Surgery. Some patients may need surgery. Your doctor can describe several different surgical procedures to treat BPH. Which procedure is best depends on your symptoms and medical condition.

What HYTRIN does

HYTRIN relaxes the tightness of a certain type of muscle in the prostate and at the opening of the bladder. This may increase the rate of urine flow and/or decrease the symptoms you are having.

- HYTRIN helps relieve the symptoms of BPH. It does NOT change the size of the prostate, which may continue to grow. However, a larger prostate does not necessarily cause more or worse symptoms.
- If HYTRIN is helping you, you should notice an effect on your particular symptoms in 2 to 4 weeks of starting to take the medication.
- Even though you take HYTRIN and it may help you, HYTRIN may not prevent the need for surgery in the future.

What you should know while taking HYTRIN for BPH

WARNINGS

HYTRIN Can Cause A Sudden Drop in Blood Pressure After the VERY FIRST DOSE. You may feel dizzy, faint, or "light-headed" particularly after you get up from bed or from a chair. This is more likely to occur after you've taken the first few doses, but can occur at any time while you are taking the drug. It can also occur if you stop taking the drug and then re-start treatment.

Because of this effect, your doctor may have told you to take HYTRIN at bedtime. If you take HYTRIN at bedtime but need to get up from bed to go to the bathroom, get up slowly and cautiously until you are sure how the medicine affects you. It is also important to get up slowly from a chair or bed at any time until you learn how you react to HYTRIN. You should not drive or do any hazardous tasks until you are used to the effects of the medication. If you begin to feel dizzy, sit or lie down until you feel better.

- You will start with a 1 mg dose of HYTRIN. Then the dose will be increased as your body gets used to the effect of the medication.
- Other side effects you could have while taking HYTRIN include drowsiness, blurred or hazy vision, nausea, or "puffiness" of the feet or hands. Discuss any unexpected effects you notice with your doctor.

Other important facts

- You should see an effect on your symptoms in 2 to 4 weeks. So, you will need to continue seeing your doctor to check your progress regarding your BPH and to monitor your blood pressure in addition to your other regular check-ups.
- Your doctor has prescribed HYTRIN for your BPH and not for prostate cancer. However, a man can have BPH and prostate cancer at the same time. Doctors usually recommend that men be checked for prostate cancer once a year when they turn 50 (or 40 if a family member has had prostate cancer). These checks should continue even if you are taking HYTRIN. HYTRIN is not a treatment for prostate cancer.
- About Prostate Specific Antigen (PSA). Your doctor may have done a blood test called PSA. Your doctor is aware that HYTRIN does not affect PSA levels. You may want to ask your doctor more about this if you have had a PSA test done.

How to take HYTRIN

Follow your doctor's instructions about how to take HYTRIN. You must take it every day at the dose prescribed. Talk with your doctor if you don't take it for a few days, you may have to restart it at a 1 mg dose and be cautious about possible dizziness. Do not share HYTRIN with anyone else; it was prescribed only for you.

Keep HYTRIN and all medicines out of the reach of children.

FOR MORE INFORMATION ABOUT HYTRIN AND BPH, TALK WITH YOUR DOCTOR, NURSE, PHARMACIST OR OTHER HEALTH CARE PROVIDER.

Ref. 03-4458-R1-Revised Sept., 1993

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aerial photography. My greatest flying thrills centered around cumulus clouds while piloting jet fighters or trainers. In unrestricted airspace, I'd fly up to a gigantic buildup, pull straight up one side of a big puffy cumulus, half roll over the top–staying close to the bubbling cloud–and keep rolling as I came down the other side, half turn and descend, staying in a turn going down. What a thrill and feeling of speed.
Lt. Col. Tony Weissgarber USAF (ret.)
San Antonio

Dear Sir: For three years in World War II as an American teenager, impatient and freedom-loving, I was interned with my family in the Japanese camp of Santo Tomas in Manila. Looking up at the sky and concentrating on the shapes and movements of those free clouds was a great way to defuse my many frustrations.

Hunger, exhaustion and an uncertain future were partially put aside watching fascinating changes above. By the third year I felt I could even predict the weather–at least part of the time. Fred Hapgood and Jack Borden have put into words the wonder and adventure of my escape into cloud watching.
Jean Salet Gordon
Rancho Santa Fe, California

Dear Sir: My involvement with thermals began some 15 years ago when my primitive hang glider was upended by an invisible "cannon ball," sending me slicing vertically through the air.

The growing sophistication of my own knowledge and of glider technology led to those early two-minute flights being expanded to two hours, and to altitude gains into the realm of clouds. A miraculous transformation. The air around me, which had seemed invisible and empty, became a living entity, constantly moving and changing. Each blossom of cloud was nourished by a graceful stem of thermals, each hill and mountain enveloped by cascading eddies, like a rocky ocean shore.
Gary Wilson
Glendale, California

Lower East Side

Dear Sir: My mother ran a small dry-goods store in Astoria, Queens, from 1929 to 1960, and we would buy wholesale on the Lower East Side. The description of Louis Chock's and H. Eckstein's stores was perfect. Mother did the very same haggling and dialogue

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Meyer Steinberg
Upton, Long Island, New York

Dear Sir: As a pre-teen in the late 1930s, I remember a semiannual family shopping trip to the Lower East Side. When my father pointed out Russ & Daughters, I realized for the first time that women could be equal to men in business.
Sunya Halpern Shaw
Redwood City, California

Dear Sir: I grew up in Brooklyn, and every Sunday, Dad used to take us to the Lower East Side to buy salamis, lox and everything else. Aunt Sophie had an upstairs restaurant there, "Bells."

I was so impressed by your article I called Katz's Deli and ordered some salami and hot dogs.
Jeffrey G. Kane
Janesville, California

Edward James

Dear Sir: Michael Kernan states on page 66 that during World War II James visited Taos, New Mexico, where he met D. H. Lawrence. Since Lawrence died in 1930, such a meeting would have to be termed a visitation rather than a visit.
William Dale Bell
Chevy Chase, Maryland

Carthage

Dear Sir: You give the impression that the trireme was a Carthaginian specialty. Actually, it was the ship-of-the-line in all Mediterranean navies; by the time of the First Punic War the Carthaginian ship-of-the-line was the quinquereme. Rather than being big battleships, triremes were ordinary-size; big ones came later. The trireme ram, rather than being a "tusk-shaped timber," was a prong; the timber was just a core swathed in the effective part–a massive bronze casing. The only figure we have for a trireme is for the Athenian: 121 feet in length. It would take such a length to accommodate 170 rowers.

Dionysius of Syracuse invented the quinquereme, which was picked up by all navies. The term referred to the five men needed to pull each long oar, rather than to the number of banks of oars.

And the date of the Roman fleet's victory at Mylae was 260 B.C., not 240 B.C.
Lionel Casson
New York City

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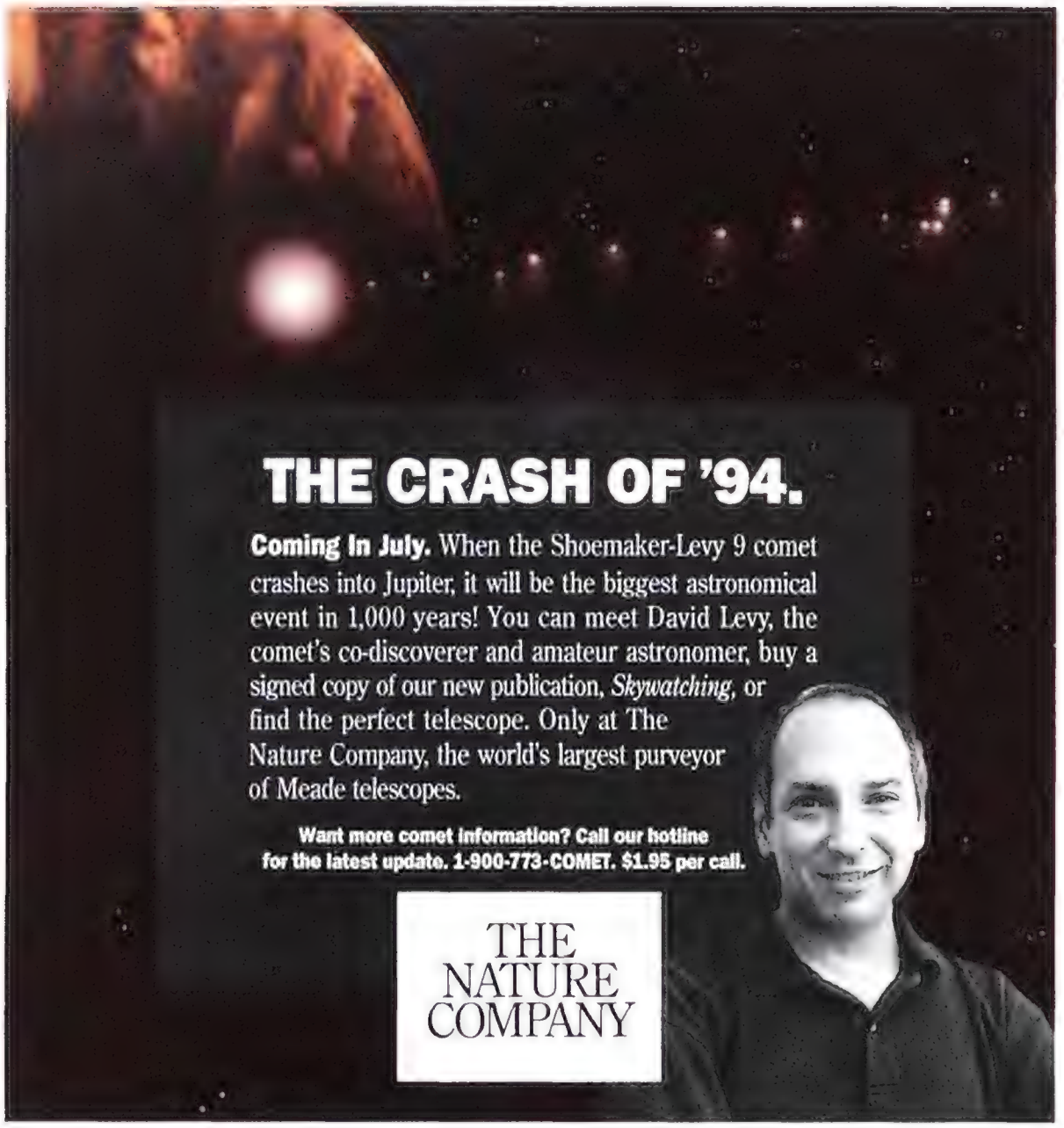
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Around the Mall and beyond

All of our friends over at the National Zoo, be they humans or beasts, took last winter's freezing blasts in stride

The winter of 1994 along our East Coast deserves to live in infamy. Even us oldsters have never seen such a siege of ice storms wrapping our world time after time in rock-hard misery. So my usual springtime visit to old friends at the National Zoo took on special meaning. How well had the tropical simians, the exotics from warm climates and the people who tend them survived winter's prison camp? Mike Morgan, the Zoo's veteran PR man, stashed me in one of the staff's golf carts for a tour. The electric vehicle hadn't been fully charged, so we crept along, overtaken by elderly ladies on foot, to the section devoted to birds.

Wild black-crowned night herons have long used the Zoo as a rookery, showing up every spring. We could see them dotting the as-yet-leafless trees. Mike told me that a half-dozen of them had come flying in a little early on February 1, just in time for one of our worst ice storms. About 20 more arrived a couple of weeks later, during the next winter blast. The bird people were simply amazed to see their fair-weather friends hunker down and brave the ice and snow.

On this pleasant day, the herons seemed comfortable enough, and their nests were unobscured–rough clumps of sticks where the young are raised, obviously in Spartan discomfort. Technicians were setting up a pair of spring-loaded rods that would bring a mist net down over a few herons attracted by some buckets of fish. Eventually they'll be donating a little blood to science, said Suzanne Ambs, who is studying herons for her

master's degree at George Mason University. "Blood typing is just another way of checking up on them." Night herons, sometimes called "quawks" because of the call they most often make, occur worldwide, and their rookeries survive in some strangely inhospitable places. The Zoo is anything but inhospitable, but I've seen them on the Patapsco River, near the smoggy industries of Baltimore, at another rookery where they dutifully flock as springtime's harbingers.

We set out to see how the Zoo's ducks were doing. Just fine, it turned out. "They have a new type of food–pellets that sink," said Mike. He showed me one of the submerged tin trays into which the pellets are dropped. "Starlings and pigeons can't steal it, and the diving ducks feel at home with it." I paused to admire some wood ducks that, along with ubiquitous mallards, act as if they own the place. As always, the sight of a male wood duck knocked me out–that incredible combination of iridescent colors, all fresh and bright in springtime. Its scientific name is *Aix sponsa*, which means, "waterfowl in wedding clothes."

Mike hurried me (at three miles an hour) to the Panda House in order to beat the busloads of kids, just arriving. Brenda Morgan (who, incidentally, is Mike's wife) introduced me to the "old gentleman," Hsing-Hsing (Mike says it's properly pronounced SHING-SHING). He's a widower now and quite ancient for a panda–about 23 years. No one knows how long pandas live in the wild, but the Morgans say that Hsing-Hsing, like other zoo pandas, wasn't expected to live much beyond 13 when he arrived back in 1972. Earlier this year Hsing-Hsing came down with a severe eye infection and started to lose his vision. But Zoo veterinarian Lisa Tell and animal eye specialist Dr. Seth A. Koch intervened with antibiotics and minor surgery. Today Hsing-Hsing seems strong, and his vision is much improved. He even eyed me amiably, gently took my proffered carrots in his teeth, then held them in one paw while chomping them down, one by one.

"Did you ever hear of a New Guinea singing dog?" asked Mike. I had not and wondered if he was putting me on. But near the Panda House we found Rebecca Smithson (a name we spell correctly around here) looking after Daru and Enga, two beagle-size, reddish wild dogs, both wagging a tail in greeting. Enga, the female, was very shy and kept her distance, though she watched us with interest. But her mate, Daru, ventured up to my closed hand, daintily sniffed it, then gave it a tentative lick. "They sing in the evening and early morning," said Rebecca. "A yodeling howl, quite distinctive." The origin of the dogs is uncertain, but they look exactly like pure Australian dingos–the same coloring, bushy tail, fox ears and wide face, heavy with jaw muscles. Yet they're about a third of the size. In the lush New Guinea

Cheetah is lured out of winter inertia for a run on the new exercise course. Fabric swatch (bottom right) whips around pulley system as big cat gives chase.

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jungles they've never had to develop the power to hunt over long distances, as dingos do in the vast outback of the mainland. "We feed them plain old dog food," said Rebecca, "and they snap up occasional rodents when they can."

On we rolled in our weary little cart, inching up grades to visit the cheetahs. They can now get a little exercise, for a running course has been set up for them in their exhibition area. Stuart Wells, the cheetah man, explained that the device is similar to those used to train greyhounds for racing. A long, strong nylon cord is strung in a continuous loop around a series of pulleys set into a plot of ground a little larger than two acres. The cord carries a lure–a simple patch of faded blue denim, probably from someone's jeans. Power comes from the starter motor of an old Ford. It spins a metal wheel that pulls the cord really fast. And as the old blue rag whips around the course, pulley to pulley, any cheetah will give chase.

The big cat reacts just as does your little cat when you yank an old necktie past its hiding place under the sofa. Stuart showed me the small switch button that controls the motor. "You have to keep the lure moving at just the right speed," he said. "Too slow, and the cheetah will catch it; too fast, and the cat will give up in order to save energy." The animal is what Stuart calls a "rotary galloper"–left front leg hitting the ground first, followed by right front, left rear and right rear in that order–or in the reverse. On the 30-yard straightaway, the cat may hit 35 miles per hour.

Stuart led me through a gate and past the cheetah enclosures. I was instantly stalked by a young female–cheetah, that is–who rubbed her shoulder against the wire fence and invited me to scratch under her chin. I forbore. She looked wonderfully healthy, but Stuart said that in the spring, after winter's long inactivity, cheetahs get soft and are good for only about three laps on the exercise run. By fall, with their muscles stretched and hardened, they can handle eight.

Mike Morgan felt I should pay my respects to the youngest orangutan–about 3 years old–so we urged our cart gently toward the Great Ape House, where Lisa Stevens awaited us. I'd met her before and benefited from her expertise and unflagging enthusiasm for her charges. The Zoo's orangs and gorillas tend to live a soap opera life–lots of publicity, masses of fans, great conjecture about who is carrying on with whom, and much oohing over the babies. And Lisa knows all about every one of them. As we arrived, and she let us in through the back door of her domain, we had only a moment to see young Chang jr., clinging to his mother and looking down on us from a loft. He reached out a hand and rapped the cage wiring with his knuckles. "He's showing you he's a tough guy," said Lisa. "That's a typical orang for you."

Chang jr.'s mother was caught fooling around with an old friend after she had mated with another orang, and so the Zoo had to test the baby's blood to find out which of the two males was his father (*Highlights continued*, August 1991). Lisa recounted the episode: his mother, Pensi, is a Sumatran orang, and the Zoo people wanted a full-blooded Sumatran baby instead of a hybrid. So they borrowed a Sumatran male, Chang, from the Louisiana Purchase Gardens and Zoo. But Pensi had always had a crush on Junior, a huge hybrid male who rat-

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tles the cages here in Washington. When Chang showed up from Dixie, Pensi took one look and, said Lisa, "it was hate at first sight." Placed with her, Chang began to limp. Pensi had been biting the poor guy's feet. "After a while they settled down and mated," said Lisa. "And then we discovered Pensi and her old favorite, Junior, pressed together at the door that separated them. Between the door and its frame was a narrow space so that incredibly, well . . ."

A situation right out of the TV soaps.

Now we know it was Chang's baby. So its name is Chang jr.–perhaps just to cover any lingering uncertainties. We gazed at the stars of the drama and walked out past the backs of the cages–keeping well away from the mesh. A great ape can reach out a long way. Besides, Lisa told me, "they've had their eyes on your blazer since you came in, and there's nothing they'd rather have than that cap."

At the white-cheeked gibbon enclosures we visited three more infants, one only 3 weeks old, weighing about a pound and as cute as a button. Gibbons are born blond then change color to black when a year old. But the females turn back to blond when sexually mature. Three infants are a triumph, for these are highly endangered animals in the wild, and there are only about 50 of them in North America. We now have one-fifth of them all.

I noticed that concrete was hardening in squares dug outside the Great Ape House as though for foundation work. Mike Morgan explained that next spring a new exhibit called "Think Tank" will be opening in the old Monkey House, and that a series of eight steel towers will be raised between this house and the site of the new exhibit, down the hill. Steel cables strung between the towers will give the apes an exercise "skyway," where they'll show off their hand-over-hand travel skills (Mike called it brachiation). In this way the apes will arrive at their own "classroom," where they will learn a computer language while visitors watch. "If they learn to communicate with us," said Mike, "the plan is to make the setup interactive so that visitors can ask them questions and get answers." I pondered that all the way home. What do you ask an orang? "How's it going with you, old fellow?" And what will he answer? Perhaps with a quote from Oliver Twist–"Please, sir, I want some more."

Edwards Park

Phenomena, comment and notes

One man's sci-fi dreams "to boldly go where no man has gone before" have become reality–in less than 30 years

The American Association for the Advancement of Science (AAAS) was founded by a group of New York geologists way back in 1848. It has grown to be a huge organization, boasting hundreds of thousands of members and sponsoring a major annual meeting. At these meetings, the speakers list sparkles with the names of Nobel laureates, and many of the country's top names in science put in an appearance. The AAAS, in other words, comes about as close as you can get to being an expression of the mainstream scientific establishment in this country. Imagine my surprise, then, when I got the hefty program for this year's meeting and found, bold as brass, a listing for a daylong seminar titled "The Science in *Star Trek*: Bringing Science to a Different Public."

Now don't get me wrong. I am a great fan of *Star Trek* (both generations) and could probably qualify as a low-grade "Trekkie." I still count as one of the great unsung advantages of fatherhood the fact that when my older sons were small, I was able to sneak into *Star Trek* conventions under the pretense of chaperoning them. I was the envy of my childless colleagues when I recounted my meetings with bridge officers Lieut. Comdr. Montgomery (Scotty) Scott and Lieutenant Uhura. And, much to my wife's chagrin, I even bought a science officer's patch like that on Mr. Spock's uniform and sewed it on the inside breast of my academic gown. I mean, anyone can be a professor, but how many people get to be science officers?

So I have nothing against *Star Trek*–far from it. It's just that in my mind this show (and science fiction in general) has always been classed as recreation. Science fiction is something you encounter when you want to relax with a rip-roaring good story. It certainly isn't something that I would have associated with the kind of serious, august (not to mention stuffy) business that normally goes on at AAAS meetings.

So when I walked into the meeting room and looked around, I was a little surprised. The audience was the same you'd see at any of the sessions–gray-bearded professors in tweeds, scruffy graduate students, a few reporters. And the program certainly had an academic quality–aside from an author and a few television types it featured several high-profile scientists, just as any other seminar at the meeting.

Indeed, once they got us thinking about it, most of us in the audience quickly realized that there is an awful lot of science buried in the *Star Trek* series. Yoji Kondo, who in normal life is the director of the NASA International Ultraviolet Explorer satellite program, looked at the original series (which debuted in 1966) from the point of view of modern science. After all, there have been nearly three decades of scientific and technological development since the starship *Enterprise* began its five-year mission, and it makes sense to ask whether any of the far-out devices in the original program are any closer to reality today than they were then. Is science fiction really a good predictor of future technology, as the conventional wisdom tells us, or is it just, in the end, another kind of fiction?

Mr. Spock's futuristic control panels presaged today's cash register keypads.

Kondo argues that there are three different kinds of science in the old *Star Trek*: science that has become a reality in the 1990s; science that could plausibly become a reality soon; and science and technology that still remain implausible 30 years down the road.

It is, I suppose, the last category that comes to most people's minds when they think about science fiction. The capability of traveling faster than light, such as in the famous "warp drive," remains just as unlikely today as it was 30 years ago. So do the transporters (which scramble a person's atoms and re-create them in a distant place) and force fields. On the other hand, a lot of things that seemed to be pure fiction in 1966 don't seem so farfetched today. The fearsome "photon torpedoes" of the USS *Enterprise* don't look too different from the x-ray lasers that were being developed as part of the Strategic Defense Initiative of the 1980s. On a more peaceful note, the machines in the sick bay–the ones where you lie on an examining table and a computer instantly diagnoses your malady–seem less fanciful in a time when magnetic resonance imaging (MRI) and computerized axial tomography (CAT) scanners are to be found in any reasonably well equipped hospital.

It was the first category of *Star Trek* science, however, that really grabbed my attention. I am, alas, old enough to remember the science of the mid-'60s from firsthand experience. In those days a telephone was a black instrument wired to a wall (and serviced, believe it or not, by repairmen from the telephone company). One of the more farfetched features of *Star Trek* were hand-held communications devices. Whenever a member of the crew wanted to talk to someone, he or she flipped the cover off, got a cheerful chirping sound to indicate the system was working and started to talk. The *Star Trek* devices even *looked* like cellular phones! Nowadays, of course, you see such devices almost everywhere.

Or consider computers. In 1966, a basic computer could easily take up several climate-controlled rooms. One issued commands to it by means of stacks of punched cards. To those of us toiling away in the basements of computer buildings around the country, the ma-

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chines on *Star Trek* seemed ridiculous. For one thing, they fit on top of a desk and, in some cases, could even be carried around by crew members. The main computers were even operated by voice commands. Surely these things were as implausible as warp drive!

Today, of course, even grade school children have access to personal computers or laptops that bear an uncanny resemblance to those prototypes used by the *Enterprise* crew. And although most of us still interact with our computers through a keyboard, as I am doing in writing these words, voice-operated computers do exist. Reasonably priced models are just around the corner, and many of us will be using them by the end of the century.

I could go on, but one more example will nicely illustrate how much science fiction of the '60s has become reality today. Part of the AAAS program (as you might expect) consisted of clips from various *Star Trek* episodes. Watching them after listening to the talks was intriguing. I found myself ignoring the main action and looking at the stuff in the background–the technological infrastructure of the show, if you will. Next time you watch reruns of the old *Star Trek,* pay attention to these details–it's a whole new experience. For instance, one clip shown was of the transporter room–the place where the transporter brought people into the ship. Looking over the shoulder of the man operating the transporter, I had a shock. The control board looked much like the cash register at a modern McDonald's! It had a similar bank of colored panels and seemed to operate by having someone touch the colored lights.

So from a purely historical point of view the AAAS session was certainly interesting, if only as a reminder of the way that one generation's fiction has a habit of becoming the next generation's fact. But even as I came to this realization, I knew that there was more to what I was seeing than just an academic interest in technological history. That alone wouldn't explain why scientists filled a large ballroom, or why they hung around all day to hear about a television show made more than 25 years ago.

I started thinking about the connection between the serious pursuit of science and the kind of people who follow science fiction. I recalled an essay by the late author and polymath Isaac Asimov, who claimed that there was a clear connection between the two. He used an episode from Greek mythology to make his point: when the Greeks were assembling their armies for the Trojan Wars, the hero Achilles, prophesied to die at Troy, was sent to hide out in another kingdom. He disguised himself as a maiden in the women's quarters. But his colleague Ulysses smoked him out in an unusual way. Ulysses laid out a table full of baubles and fabrics of interest to the women, in the center of which he placed a sword and armor. He then invited the ladies in and, when one "girl" made a beeline for the arms, Ulysses had his man. Asimov's argument: science fiction is the sword of Ulysses. It's a diagnostic that tells you which child in a crowd is likely to turn out to be a scientist. That one will gravitate to this genre much as Ulysses was drawn to the sword.

How many of the men and women in

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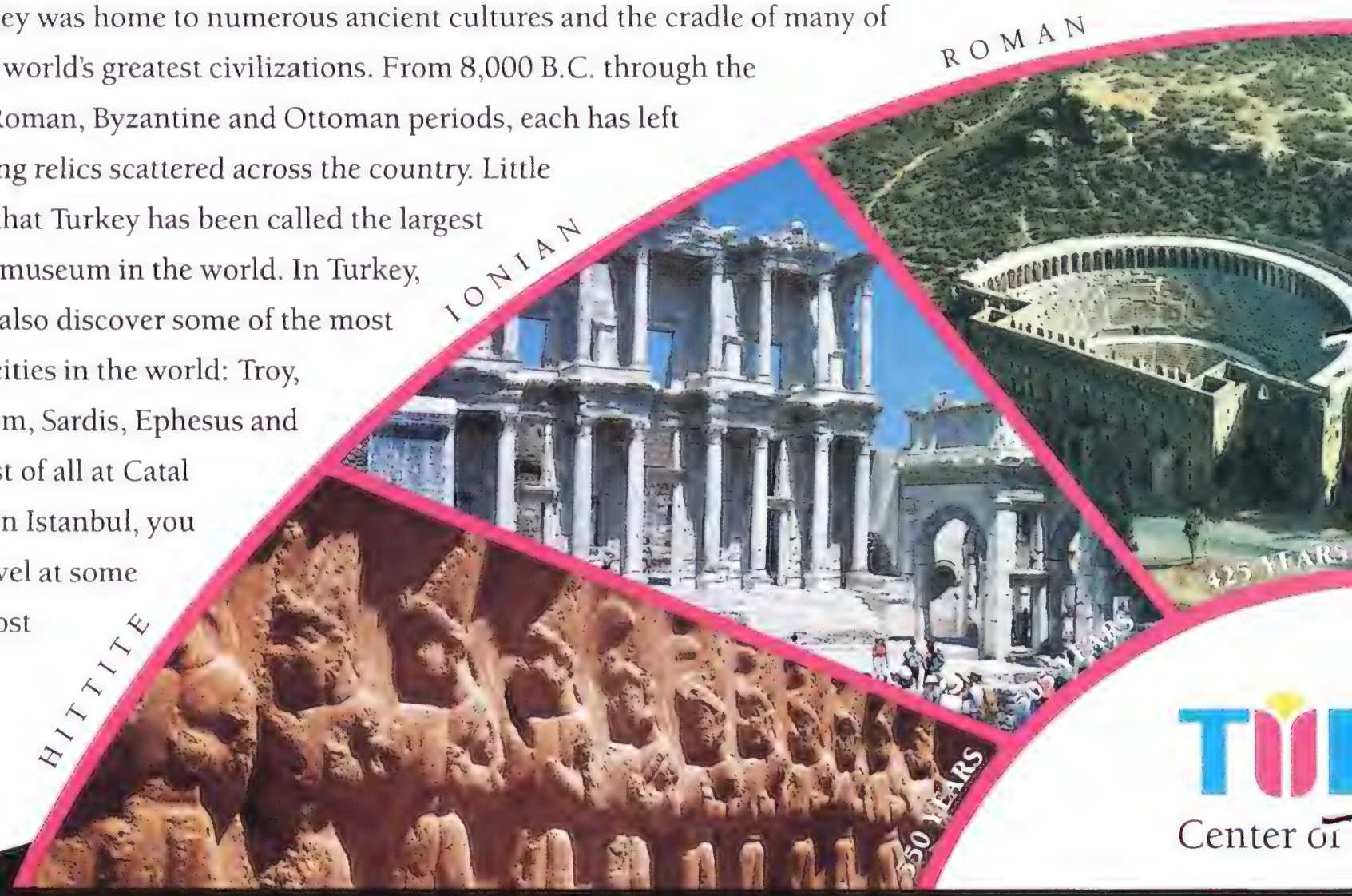

8,000 B.C.

Center of

that audience, I wondered, had spent a good fraction of their youth buried in science fiction books, as I had? How many sets of parents, like mine, had worried and asked them if they wouldn't, perhaps, like to go out and play baseball for a while? And how many of those kids had decided that baseball couldn't compete with a flight to Aldebaran or the lost knowledge of the Krell? If my own experience is any guide, a lot of the people in that room, and their counterparts in laboratories around the world, were brought into science by an interest in things like *Star Trek*.

The speaker who put her finger on this point was Majel Barrett Roddenberry, the widow of *Star Trek*'s creator, Gene Roddenberry. She played nurse Cristine Chapel on the original show and portrays Lwuxana Troi, the "Auntie Mame of the Galaxy," on the current popular television series.

Roddenberry told about how, back in the '60s, they would go to high-tech companies in the then burgeoning Silicon Valley for technical help and ideas. Time after time, a corporate boss would send them along to bench scientists with the order, "Give these guys what they want." Why would otherwise hard-headed executives behave this way? Were they, too, somehow captivated by science fiction? "Gene Roddenberry once remarked that science fiction was prescience, pre-science, 'knowing before,'" Majel Roddenberry said, adding that her late husband had also noted that "'the role of the science fiction writer is to daydream.' In doing so, images of the future come into being as ideas, and are often quickly followed by a desire to turn those ideas into reality. Nowhere is this more apparent than in *Star Trek*, which introduced many such ideas that were taken seriously by scientists and now exist in our lives today.

"Science fiction writers, artists and filmmakers have a unique task," Roddenberry continued, "to portray that which we have never seen."

As soon as these words left her mouth I realized that I had an answer, not only to the question of why this session was included in a stuffy scientific meeting, but also to the issue of why scientists are so taken with science fiction. I'm sure that if you had asked those executives in the '60s (or their modern counterparts) about why they were willing to expend scarce resources helping a television show, they would have talked at length about ensuring the supply of future scientists and educating the public. But in their heart of hearts, I'm sure that they, like those of us in that room, had been put in contact with their dreams.

And what glorious dreams they are! In the world of *Star Trek*, there are still problems, of course, but human beings have learned to deal with them without falling prey to so many of the failings that characterize modern society. A multinational and multiethnic crew works together with, for the most part, true respect and friendship. No matter how difficult the circumstances, they can be dealt with reasonably. And in the end, good always triumphs over evil! Aren't these dreams worth having?

James Trefil

The author is Robinson Professor of Physics at George Mason University.

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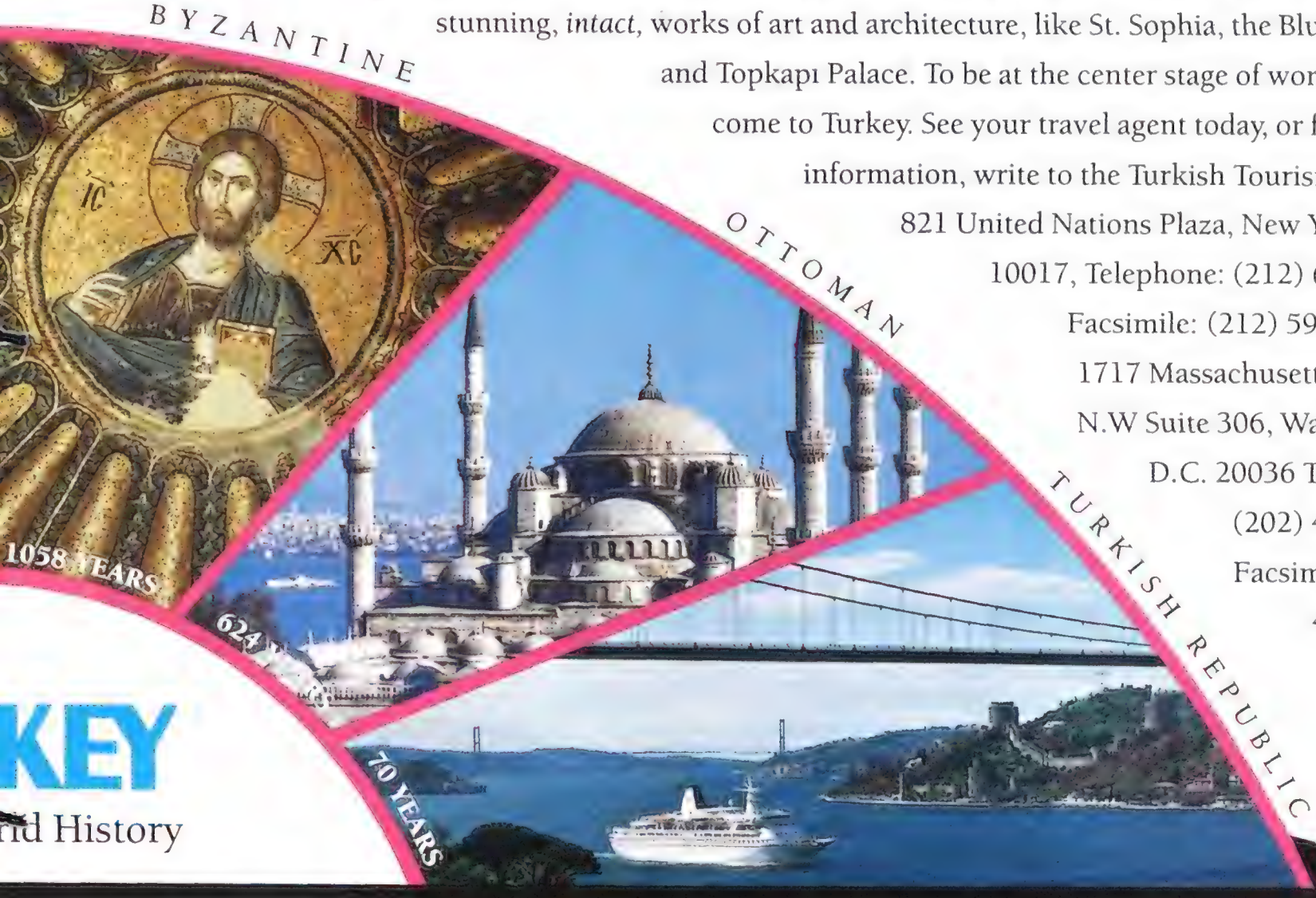

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Smithsonian highlights

Planning a Smithsonian visit?

Receive a special free Associates' Planning Packet. Write Smithsonian Information, Smithsonian Institution, Washington, D.C. 20560, or call (202) 357-2700, daily, 9 A.M.- 4 P.M.; for callers with communication impairments, TTY: (202) 357-1729. *Note:* Parking near Smithsonian museums is limited. The convenient Metrorail subway system has parking available at some stations (details in packet).

Begin your visit at the Smithsonian Information Center's Associates' Reception Desk–open 9 A.M.- 4 P.M. daily–in the Castle. The Court dining room, located in the National Museum of Natural History, offers buffet service daily, 11 A.M.- 3 P.M.

Extended summer hours

Starting Monday, June 13, through Labor Day, Monday, September 5, the National Museum of American History, the National Museum of Natural History and the National Air and Space Museum will operate on extended hours daily, 10 A.M.- 6:30 P.M. Hours at the National Zoo are 9 A.M.- 6 P.M. daily for buildings, and 8 A.M. to 8 P.M. for grounds, through September 15. Other Smithsonian museums are generally open from 10 A.M.- 5:30 P.M. daily.

Festival of American Folklife

The 28th annual Smithsonian Festival of American Folklife will be held on the Mall, July 1-4 and 7-10, from 11 A.M.- 5:30 P.M., with a dance party each night from 5:30 - 7 P.M. and a concert from 7 - 9 P.M. Cosponsored by the National Park Service, the festival will feature programs on Thailand, the Bahamas, traditional arts in the United States, and grassroots culture in Latin America. Events will include craft demonstrations, performances, storytelling, cooking.

Special June exhibits, events

National Air and Space Museum

Destiny In Space (daily starting June 22; 10:45 A.M., 1 P.M., 3:15 P.M., 5:25 P.M.) New Imax film is latest in trilogy that includes *Blue Planet* and *The Dream Is Alive.* See *Highlights continued*, page 30.

Patty Wagstaff–National Aerobatic Champion (through March 1995) Exhibit features Wagstaff's Extra 260 aircraft and recognizes her accomplishments as U.S. National Aerobatic Champion.

Universe of Illusions (runs indefinitely) New Einstein Planetarium show looks at some of the mysteries in the history of space exploration.

Where Next, Columbus? Permanent exhibition examines various issues involved in future space travel.

National Museum of Natural History

Spiders! (June 11-January 2, 1995) Revealing look at these eight-legged master builders–live and mounted specimens, videos, photographs, interactive displays, prose, poetry, spider myths.

The Tongass: Alaska's Magnificent Rain Forest (through September 10) SITES exhibit captures the beauty and biological diversity of this old-growth, temperate-arctic rain forest in a series of 42 large-format photographs.

Giant Squids Permanent installation of rare specimens, photographs, videos and interactive displays.

Painting Wondrous Wings (through July 31) Watercolor illustrations of butterflies by artist Vichai Malikul.

O.Orkin Insect Zoo Newly renovated insect zoo features various insect habitats, an unusual look at insects in your home and an African termite mound.

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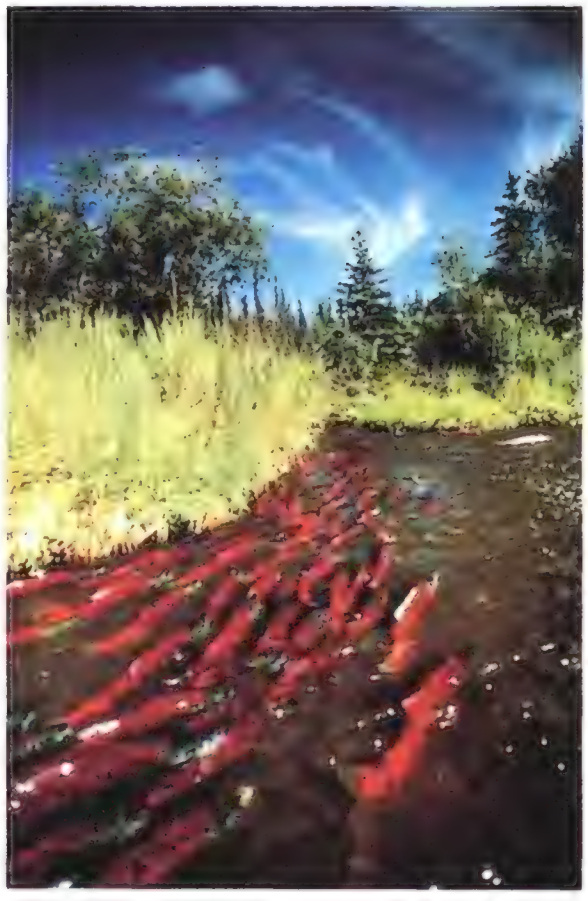

Wild Salmon Running Upstream by Art Wolfe is in NMNH's *Tongass* exhibition.

National Zoological Park

Amazonia Permanent installation re-creates a microcosm of the world's largest rain forest and river habitat, explores the wonders of richly diverse ecosystem.

National Museum of American History

The Guitar in American Popular Music (June 7-November 6) Exhibition charts the changing role of the guitar in American popular music from the mid-19th century to the present.

Shipwreck Treasures: Lost and Found (June 21-November 13) Showcase display looks at field research being conducted on the *Indiana*, a cargo ship that carried 280 tons of iron ore when it went down in Lake Superior in 1858.

Science in American Life New exhibition tracks advances and discoveries in science over the past 125 years–from aspirin to the atom. Includes re-creation of 1876 chemical lab at Johns Hopkins University and model of atomic chain-reaction. See *Smithsonian horizons*, page 8.

World War II GI: The American Soldier's Experience New permanent exhibit presents a firsthand look at the U.S. military.

American Encounters Permanent display focuses on the American Indian, Hispanic and Anglo-American cultures of New Mexico's Upper Rio Grande Valley.

First Ladies: Political Role and Public Image Permanent installation looks at the various roles of our nation's First Ladies and the public's perceptions of them, incorporating the historic gown collection.

National Postal Museum

The Smithsonian's newest museum, located next to Union Station on Capitol Hill, presents exhibitions tracking the history of the nation's mail service–from the Colonial Post and the Pony Express, to the beauty and lore of stamps.

The Madden Family Letters (through July 30) Exhibit traces five generations of an African-American family (1740-1992).

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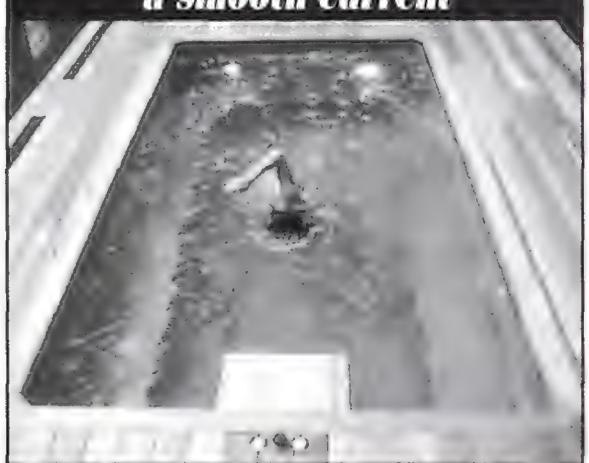

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Arthur M. Sackler Gallery
Contemporary Porcelain from Japan (through September 5) Innovative and varied porcelain vessels–30 works by 30 masters–were recently donated to the Sackler by the Japan Foundation.
A Mughal Hunt (through September 11) Exhibit unlocks the identity of a 17th-century painting from India's Mughal dynasty that depicts a young prince shooting an antelope.
Sculpture of South and Southeast Asia (runs indefinitely) Works from Cambodia, India, Pakistan and Tibet represent the three major religions of South and Southeast Asia.

Freer Gallery of Art
Masterpieces of Chinese Calligraphy (June 11-February 1, 1995) The art of more than 30 calligraphers exemplifies all four major scripts and the four primary formats. Many of the objects date to the Ming dynasty (1368-1644).
America Meets Asia Newly renovated and reinstalled galleries feature Asian and 19th- and early 20th-century American art, including an important collection of works by James McNeill Whistler.
Luxury Arts of the Silk Route Empires (runs indefinitely) Adjoining galleries showcase objects from the Freer and Sackler collections, tracing the cultural interchange along the Silk Route.

National Museum of African Art
Beaded Splendor (June 1-October 9) Show explores how beads have been incorporated into African dress and regalia to create works of art that express both individual status and group identity.
Face of the Spirits: Masks from the Zaire Basin (through September 25) Exhibit brings to life the complex masking traditions and diverse cultures of the peoples of the Zaire Basin.
Images of Power and Identity Permanent installation showcases 100 masterworks from the collection.
Purpose and Perfection: Pottery as a Woman's Art in Central Africa Permanent exhibition features the museum's Central African pottery collection.

Hirshhorn Museum & Sculpture Garden
Felix Gonzalez-Torres (June 16-September 11) Minimal, interactive, mixed-media installations by the Cuban-born, New York-based artist transform stacks of paper and fields of wrapped candies into ruminations on personal experience and social issues.
Directions–Sue Coe (through June 19) Large-scale narrative drawings explore issues such as violence against women, racism, capitalism and war.

National Museum of American Art
Thomas Cole: Landscape into History (through August 7) A retrospective of the work of the father of the Hudson River school of landscape painting.
North American Wildflowers: Watercolors by Mary Vaux Walcott (through August 29) A selection of 50 watercolors by American artist, naturalist and photographer Mary Vaux Walcott (1860-1940).
Capital View: A New Washington Panorama by Mark Klett (through August 14) Photographer Mark Klett's 360-degree panorama of Washington, D.C. created from views shot from the tower of the Old Post Office Building in 1992-93.

Renwick Gallery
Contemporary Navajo Weavings: The Gloria F. Ross Collection of the Denver Art Museum (June 3-August 21) The artistry of modern Navajo weaving. Show focuses on individual weavers and the circumstances that nurtured their creativity.
American Crafts: The Nation's Collection (runs indefinitely) Selection of 19th- and 20th-century works from the permanent collection features pieces by nationally prominent artists.

National Portrait Gallery
Art and the Camera, 1900-1940: Pictorialist Portraits from the National Portrait Gallery Collection (June 10-December 11) The development of pictorialism from the turn of the century through the 1930s–Alfred Stieglitz, Edward Weston, Doris Ulmann, and others.
Reporting the War: The Journalistic Coverage of World War II (through September 5) Paintings, photographs, recordings, manuscripts and memorabilia document the war experiences of 35 journalists, including Ernest Hemingway, Margaret Bourke-White and Ernie Pyle.
To the President: Folk Portraits by the People (through September 5) One-of-a-kind gift portraits span 60 years, 11 Presidencies.
Recent Acquisitions (through December 4) Portraits of notable Americans selected from recently acquired works.

Anacostia Museum
Malcolm X: Man, Ideal, Icon (through June 5) Exhibit organized by Minneapolis' Walker Art Museum offers an in-depth look at the life and philosophy of the African-American leader–paintings, videos, photographs.

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International Gallery,
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Talents of the Brush: Jill Sackler Chinese Calligraphy Competition (through September 25) More than 100 prizewinning works selected from the 1990 and 1992 competitions held in Beijing represent all major styles of calligraphy.

Cooper-Hewitt Museum (New York)

A Royal Gift: The 1826 Porcelain Jewel Cabinet (through September 18) Originally presented in 1830 by Charles X of France to King Francis I, King of the Two Sicilies, the unique cabinet was made at the renowned Royal Porcelain Manufactory at Sèvres, France.

Packaging the New: Design and the American Consumer, 1925-1975 (through August 14) The role of the designer during America's golden age of industrial design–selections from the museum's Donald Deskey Archive.

Exhibition catalogs

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The watercolors of Mary Vaux Walcott are featured at NMAA; here, *Umbrella Tree.*

Smithsonian on the air

Smithsonian Presents Invention Series of half-hour television programs explores the spirit of innovation behind everyday and extraordinary inventions. Tuesdays at 9 P.M., EST, on the Discovery Channel. Check local cable listings.

To obtain a free listing of Smithsonian home video titles, which includes the *Invention* series, write: Office of Telecommunications, Smithsonian Institution, American History Building, MRC 645, Washington, D.C. 20560.

Resident Associate Program

To become a Resident Associate, or for fee and ticket information, call (202) 357-3030. June events include:

Gloria Steinem: "Moving Beyond Words" (June 28; 7:30 P.M.) Lecture, book signing, by the influential feminist leader.

A Firsthand Look at the World Economy Since the Wars (June 6; 8:15 P.M.) Lecture by economist John Kenneth Galbraith.

The Russian Tea Room Comes to the Smithsonian: A Tasting Dinner Lecture (June 13; 6 P.M.) Faith Stewart-Gordon, proprietor of New York's Russian Tea Room, shares reminiscences and recipes of the legendary eatery.

Wu Han and David Finckel in Concert (June 12; 7 P.M.) Performance by Taiwanese pianist Wu Han and Emerson String Quartet's cellist David Finckel.

Smithsonian Institution Traveling Exhibition Service

SITES organizes and circulates exhibitions to cities throughout the United States and abroad. To sponsor a show in your community, write SITES, Smithsonian, Washington, D.C. 20560. Here are some June exhibits:

- Chicago, Illinois (June 25-August 28) *Before Freedom Came: African-American Life in the Antebellum South*, DuSable Museum of African-American History.
- Harlingen, Texas (June 5-July 31) *Two Eagles/Dos Aguilas: A Natural History of the Mexico-U.S. Borderlands*, Rio Grande Valley Museum.
- Rochester, New York (June 18-September 7) *Songs of My People*, Strong Museum.
- Santa Barbara, California (June 21-July 31) *Art as Activist: Revolutionary Posters from Central and Eastern Europe*, University of California Art Museum.

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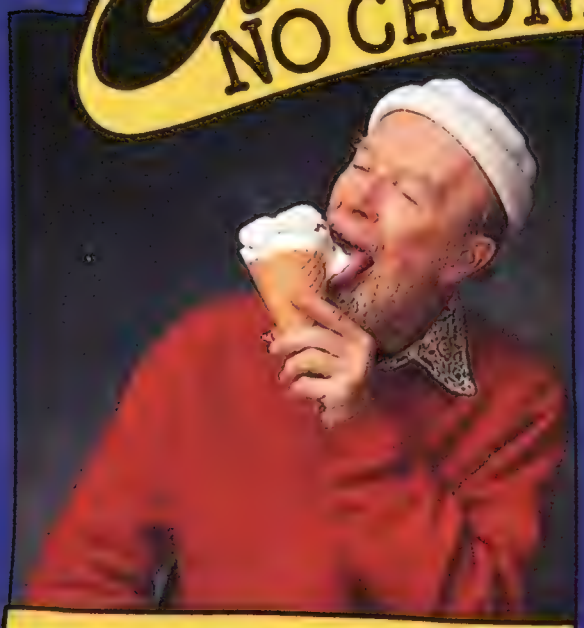

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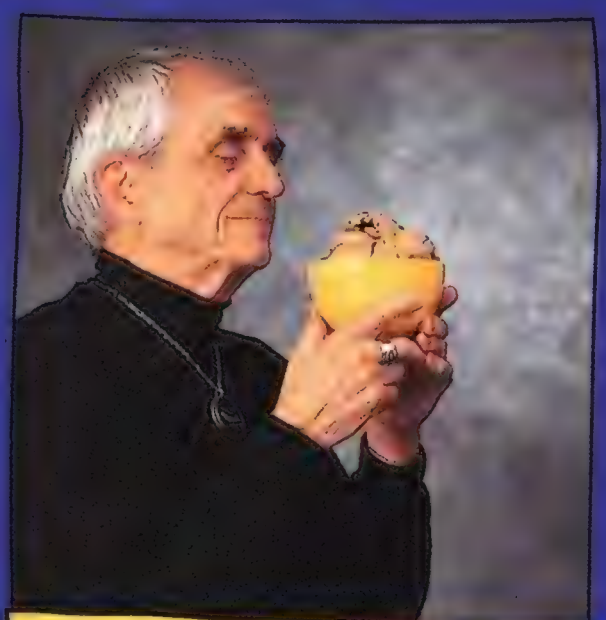

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Seeking our destiny in space

We are enveloped in the vast darkness of space, surrounded by sound. Earth appears, tiny, jewel-like, amid a sparkling field of stars. Back on Earth, a giant radio telescope scans the Universe for indications of life. Suddenly the sound crescendos into a roar, and we are engulfed in fire and orange smoke as the space shuttle hurtles upward into the night. Traveling at nearly 18,000 miles per hour, it is on its way to work–on its way to help map our future in space.

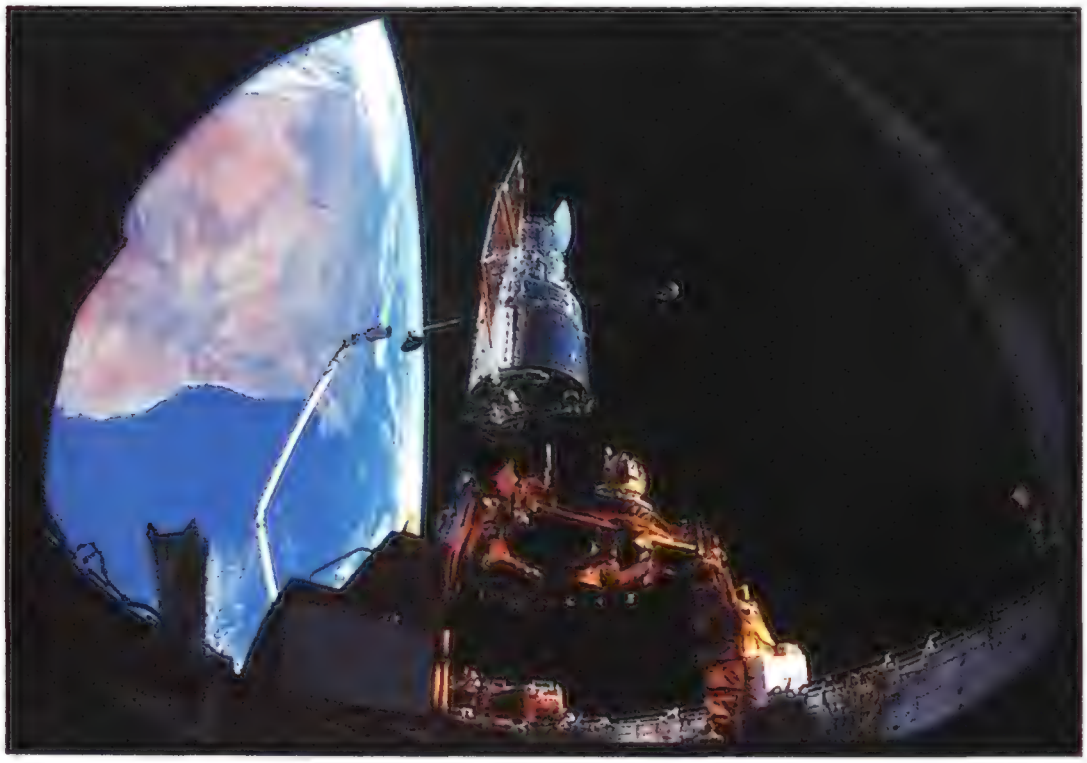
From the confines of Spacelab to the infinite reach of space, from the red-hot landscape of Venus to the blue expanse of Earth's oceans, a new Imax film, *Destiny In Space*, takes viewers on a voyage that tells the story of human and robotic space exploration.

Presented by the National Air and Space Museum and Lockheed Corporation in cooperation with NASA, the Imax production premieres June 21 at NASM's Langley Theater. The 40-minute film incorporates footage taken during nine shuttle flights and features never-before-seen images of the space shuttle in flight around Earth, computer-generated flyovers of Mars and Venus, and dramatic footage of the launch, retrieval, servicing and redeployment of the Hubble Space Telescope. The film will open at selected theaters by mid-July and worldwide in November.

Diane M. Bolz

All: © 1994 Lockheed Corporation/Smithsonian Institution

Space shuttle *Discovery* orbits 200 miles above Earth. Unique image was taken by remote IMAX camera mounted on satellite in parallel orbit. At left, Hubble Space Telescope is deployed in 1990 from shuttle cargo bay. After 1993 servicing, Hubble is redeployed (below) over the Cape of Good Hope.



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By Jack Hope

Wolves and wolf hybrids as pets are big business–but a bad idea

Wild genes ultimately prevail: keeping a wolf in the house almost invariably turns out to be a fatal attraction–usually for the animal

With their "oohs" and "aahs," the evening crowd of 300 or so gathered around a Colorado park campfire signal their admiration for the handsome female gray wolf moving so smoothly among them. Wide-eyed children pose the sometimes frightened but mostly delighted questions any youngster would ask:

"Does she bite?"

"Can I pet her?"

"Would she like some M&Ms?"

The animal seems equally delighted but is held short on a leash by one of her two Mission:Wolf caretakers, Tracy Brooks. The gray-white, 100-pound Sila surges powerfully about the circle, steadily wagging her tail. She sidles up to the children and every so often flings herself down on her back, legs sprawled wide, for her belly to be scratched.

There seems to be nothing savage about this 100 percent *Canis lupus*. Indeed, with her unusual combination of wild elegance and affectionate interaction with humans, Sila appears to be precisely the noble yet tender canid most Americans would welcome in their backyards or living rooms.

During the past three days at Mission:Wolf–a fenced, forested haven in south-central Colorado run by Brooks and her partner, Kent Weber, for 38 discarded pet wolves and wolf-dog hybrids–I've many times seen Sila, an alpha (dominant) female, prevail over other animals, with ferocious growls and nips, in a wolf pack's never-ending competition for food and social rank. And she is here in the first place because she bit her original owner (while still a puppy). Yet 4-year-old Sila is a dream–a ham, almost–with people. She crisscrosses the nation with Brooks and Weber on their educational tours of schools and universities. Sila regularly graces the studios of network television and has slathered her tongue across the faces of an eclectic assortment of souls, from Mister Rogers to Ted Turner.

Sila, a 4-year-old pure wolf, quickly shows Fenris, less than a year old, his position in the social order.

Among the quarter- to half-million captive wolves and wolf hybrids now residing in the United States, however, Sila is an exception in her winning ways with people. And as a direct result, she's also an exception in still being alive at the age of 4.

Within the past two decades, Americans have developed a particular passion for wolves and dogs with a high proportion of wolf blood. They are being bred and bought in ever-increasing numbers: animal welfare groups estimate that 250,000 new pups come to market every year.

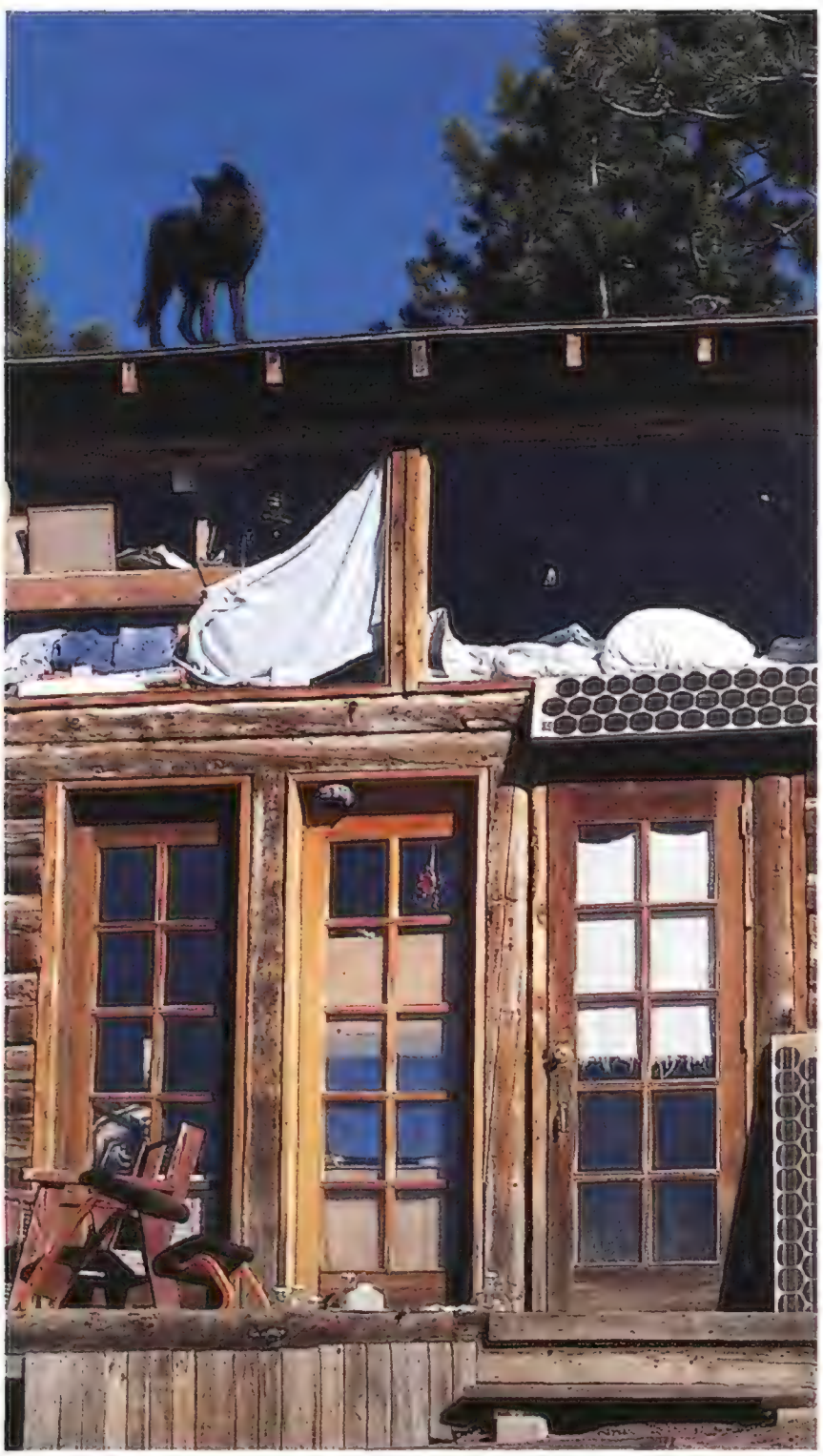
In part, the appeal of these animals appears not unlike earlier fads for such macho breeds of *Canis familiaris* as German shepherds, Dobermans, Rottweilers and pit bulls. Current and former owners typically claim, however, that the larger appeal of wolves derives from the ways–more intelligent, aloof, independent, complex and resourceful–in which they differ from domestic dogs.

Owners argue that at least some wolf-dog hybrids are less aggressive than some breeds of dog. Colleen Gallighen of Boise, Idaho, who is the owner of two hybrids (opposite), states her case. "People say: 'Oh my God, you've got wolves–they eat kids.' I disagree. I'm sold on them [the hybrids]. The biggest thing I like is the non-aggression. I was going to get a German shepherd, but they're aggressive," she says.

Thousands of Americans would agree, according to

Donovan Gallighen-Burk, age 2, romps with wolf-dog hybrids while his mother, Colleen, beams approval.

Photographs by Glenn Oakley



A female named Passion keeps an eye on things at the home of Tracy Brooks and Kent Weber in Colorado.

ownership numbers. Yet the experts are nearly unanimous in asserting that owning a pure wolf or a hybrid is a bad idea.

As pups, most wolves and wolf hybrids behave playfully, like dogs, with rough affection. But as they approach physical and sexual maturity, at about 2 years, the vast majority begin to behave as the pack-hunting, wide-ranging, highly territorial predators their wild genes have predisposed them to be. This leads to conflict with an owner who has bought one for its wild appeal and then expects it to behave like a pet.

Confined to a house, wolves and mostly-wolf hybrids urinate on all corners and carpets to mark their perceived territory and impatiently, systematically, tear apart kitchen cabinets, stuffed furniture and draperies to discover what's inside or beyond. As all owners agree, the animals treat humans as other wolves. But, genetically programmed for the ongoing struggle with pack mates for food and leadership, they have no compunction about challenging the dominant householder–usually the male–with warning growls and a flurry of bites (usually *not* deep bites) for his steak dinner or easy chair, or even for the attentions of his spouse. How to curb unwanted behavior is a subject of constant debate. When only swatted or yelled at, the wolves may not turn tail but growl and bite instead. Disciplined with a severe beating, they'll retreat but, wolf-like, will attempt precisely the same challenge an hour or a day later–in an endless contest for dominance.

Banished to the backyard, the wolves or wolf hybrids usually break free of all but the sturdiest chains or enclosures. Without food, confused, they may prowl the neighborhood attacking cats, rabbits, goats, dogs, even horses, all of which they see as prey. Their predatory instincts can also be triggered by humans, especially if those humans happen to be small or infirm, or if they flee or emit a frightened sound.

Former owners report being bitten

Since 1986 nine children in the United States, from toddlers to a 12-year-old, have been killed (and in one case partially eaten) by wolf and wolf-dog pets. Many more people, both children and adults, have been maimed. While relatively few of these animals actually kill, most of the former owners interviewed for this article report having been bitten.

The nation's handful of licensed facilities, such as Colorado's Mission:Wolf, Indiana's Wolf Park and Washington State's Wolf Haven International, along with more traditional animal welfare agencies, receive thousands of calls each year from owners seeking to find homes for the wolf and wolf-hybrid pets they've suddenly discovered they cannot control. But the nonprofit wolf shelters can together take in only a handful of the

Brooks visits one of the ten wolf families on their 75-acre reserve; animal with tail in air is dominant.

Former pets, they have come from as far as Florida; three had been living on a dairy farm in Wisconsin.

unwanted animals each year. As the dangerous reputation of these animals has spread (especially since 1988 when a wolf hybrid proclaimed "Pet of the Week" by Florida's Panhandle Animal Welfare Society killed a 4-year-old neighbor only two hours after the animal had arrived at its adoptive home), the traditional animal agencies have almost universally refused to shelter or seek homes for these creatures. Instead, they tell distressed owners that all wolf pets brought in will be "put down" immediately.

"I would estimate perhaps 80 to 90 percent of owners are experiencing serious problems with their hybrids by the time the animals are 3," says Randall Lockwood, a vice president of the Humane Society of the United States. "The result being that they are euthanized, abandoned or warehoused on chains in basements or in isolated enclosures." All too often, those not formally euthanized are either poisoned or shot by neighbors whose pets were attacked or by local authorities.

Despite years of travel in wolf country, from the Yukon to the Northwest Territories, Jack Hope has seen only one wild wolf (it may have been a coyote).

At that Colorado campfire, where Sila schmoozes with the kids, Kent Weber's message is clear: wolves do not make good pets. At Mission:Wolf, he explains, they take care of 26 wolves and 12 wolf hybrids because they have taken in the pets of others. In a half-dozen of the lower 48 states, he continues, wild wolves are making a modest comeback. And it's to that wild and natural comeback people should be giving their support, instead of trying to turn wild animals into pets of their own.

"But today," Weber continues, "breeders across the country are selling wolves and wolf hybrids to unsuspecting buyers for $250 to $1,500 apiece. They promote them not only in pet journals but in major newspapers with ads like this: 'Own a piece of the wilds! Three-week-old, 98 percent wolf pups for sale! Loyal and affectionate bonding makes them *great with kids!*' But what happens once you bring one home?"

In the 1960s captive wolves began to trickle into the eager hands of potential breeders in the lower 48 from

Hybrid pups offered for sale have an undeniable appeal, but no one can tell for sure how they'll behave as adults two or three years afterward.

a curious array of sources, including two or three fur farms in Minnesota and Wisconsin that legally bred wolves for their pelts and could be persuaded to part with an occasional pup, and from zoos–both legitimate public institutions and a small number of marginally legal impoundments known as "roadside zoos." At one time, Hollywood filmmakers were a source of supply when a picture was finished.

Perhaps most important of all, many breeders-to-be in the lower United States simply arranged with breeder-trappers in Alaska and Canada, where wild wolves were and are still plentiful, to procure and ship wild pups to them. This typically involved raiding a spring wolf den, frightening off the parents and scooping up the litter of pups, preferably before their birth-blind eyes were open so that, like naturalist Konrad Lorenz's geese, the infant animals would more readily bond with humans.

And while ownership, breeding and sale of pure wolves could break any number of federal and state laws (unless an owner possesses the hard-to-get federal Animal Welfare Dealer License and state permits for impounding a wild animal for educational or scientific purposes) the law-enforcement problem is that an illegal wolf pup looks and acts very much like a perfectly legal husky or shepherd or malamute. Furthermore, except in a half-dozen states, an animal that is in any proportion domestic dog–even as little as 1 percent–is legally defined as a dog and is thereby subject only to local pet regulations.

Even though everyone knows what's going on, illegal owners and breeders simply claim that the canids they own and sell are not pure but are 99 or 98 percent wolf, and there's no legal way of clamping down on them. When Florida passed a law in 1992 prohibiting ownership or sale of an animal more than 75 percent wolf, all of the state's captive wolves, overnight, became "74 percent wolf-dog hybrids."

With no effective means of limiting the spread of wolf and wolf-dog pets–indeed, with no real social or legislative awareness that they would quickly pose tremendous problems to themselves and to society–the number of these animals in private hands expanded exponentially, starting in about 1975.

"When I got my first black-market wolf in 1973 there were probably no more than two dozen people in the United States actively breeding and selling pups, and I knew every one of them," says Mary McBee, who was the first president of the now defunct North American Wolf Hybrid Association. "Several of us kept a registry of our new pups and their ancestry. But within ten years or so, from just an obscure few who'd fallen in love with these high-spirited animals, there were suddenly thousands and thousands, along with a half-dozen owner organizations, such as the Iowolfers and the Northwest Wolfers, and publications titled the *Wolf-a-Dog Journal* and the *Wolf Hybrid Times*."

Many current and former owner-breeders have specialized in raising low-percentage wolf hybrids (one-third wolf, or less) some of which they've personally housebroken and socialized, and which, they say, are generally far more manageable and less dangerous than wolves or near-wolves. Others, like Kent Weber and Tracy Brooks, tend to put their bets on the pure wolf as a more predictable animal because its behavior has

been so long and thoroughly studied both in the wild and in captivity.

"In their steady battle for social dominance, pure wolves seldom bite a pack mate hard enough to cause severe injury," Weber points out, "because they need every member of their pack to bring down the next moose or musk-oxen. But if you then cross that same, ever-skirmishing wolf with something like a Doberman or Akita, which we've bred for 12,000 years to bite and fight to the death, and if you put those hybrid offspring together with other dogs or with people, you've got a genetic formula for disaster."

"Predicting a wolf hybrid's behavior is a complete crapshoot," agrees animal behavorist Randall Lockwood of the Humane Society. "First, because breeders have crossed wolves with dogs from relatively docile huskies and malamutes to aggressive Rottweilers and pit bulls, so you don't have any single, consistent mixture of genes that you can identify as a 'wolf hybrid.'

"Second, even if you know exactly what breed of dog a wolf is crossed with and what percentage wolf it is–and many breeders lie through their teeth about this–there's absolutely no telling how the hybrid pup you buy is going to behave."

Promoters of wolf and wolf-dog pets argue that 95 percent of the problems, including attacks on humans, result from people's (usually the owner's) insensitivity to the animal, lack of insight into its needs and behavior, and inability to learn the subtleties of its communication through body language. This is almost certainly the case. But it is irrelevant to the victims of wolf and wolf-hybrid attacks, who tend to be children.

"As usually happens with these attacks, we have no witnesses to what really happened," says Jo An Sieker, director of the Santa Fe Animal Shelter. She was talking about a 1993 fatal attack by an 80 percent wolf-malamute hybrid on a 12-year-old, when the boy wandered within the animal's chain length. "All we know is that the boy was dead from multiple bites to the throat and torso by the time the sheriff arrived."

After four years, an attack without warning

Furthermore, even owners sophisticated in animal behavior have experienced sudden and unexpected attacks from their pets. "We'd had Nahanni [a female pure wolf] four years, and she was the sweetest creature with kids, with my husband, Bob, and me," says Beth Duman. "As a biologist and a champion of wolves, I used to take her around to the schools to teach kids just how lovely wolves really are. Then one spring afternoon Bob and I were in the backyard pen with her, petting and scratching her when–wham!–without any warning she was up on her hind legs, her front paws on Bob's shoulders pushing him back against the fence, sinking her canines deep into his right forearm. It was all over, after that. Bob could no longer go in the pen because she would attempt to attack him every time. We had to get rid of her.

"Thinking back on it, all we could figure was that Bob was limping that day when he went into the pen; he'd hurt his lower back. And that's all a wolf has to see–some little chink in your armor–and it'll be in your face like it would be with another wolf. And when we finally told our story to other wolf and wolf-hybrid people, lo and behold! most of them then fessed up that they'd been bitten or had some other potentially deadly encounter with their pets, just as we did."

There are two distinct schools of dealing with wolves and wolf dogs. In the first, an owner establishes his alpha status over the pet from the outset. If a pup challenges you for space or food, you seize it by the nape of the neck and roughly thump it on its back. Later, when the adult "gives you the eye," you stand tall, head higher than the animal's, and stare it down.

A pup runs free, but the adult "wolf" is chained in the bare dirt yard of a part-time breeder in Idaho.

In the second, used and refined by Brooks and Weber at Mission:Wolf, you never challenge the animal for anything in its mouth, including your own dinner or shoe. When you "talk to" your creatures, you crouch down, head no higher than theirs, so as to be as nonthreatening as possible. When an animal fixes its eye upon yours and leaps up with its teeth flashing inches from your face, you do not exactly avert your gaze, but you "look through and beyond" the animal, Weber says. If need be, you address it with a neutral bored expression such as "What's your problem?" or, best of all, "Bah." You have maintained superiority by trivializing the challenge. The system works, at least for them: Weber was bitten once, a long time ago, but Brooks never has been.

The best arrangement of all is never to acquire such an animal in the first place, according to Monty Sloan of Indiana's Wolf Park. "What everyone who owns a wolf or wolf hybrid ultimately discovers is that you have to be 'up' all the time to properly deal with them. Sooner or later even the most attentive owner is going to make a mistake or let his guard down, either because he thinks he owns a behaviorally exceptional animal or because he imagines himself exceptional in managing that behavior. But that's when he'll have trouble because there are no exceptions."

That's the question. Brooks and Weber would not bring a live wolf to their talks unless they were certain it would not harm anyone. Everything they have learned about wolf behavior and handling tells them that Sila is, indeed, the exception. During most of their talks in schools and other places, they keep the wolves onstage and otherwise separated from children in the audience. Sometimes a wolf will be walked over to a prechosen teacher or two to greet them and even lick their faces–part of the Brooks-and-Weber message that wolves are not monstrous killing machines. And in special circumstances a wolf–always on a tight lead–will circulate among schoolchildren. The norm, however, is to look, ooh and aah–but don't touch.

At my invitation Brooks, Weber and Sila paid a visit to the school where my own son is enrolled. Sila had already spent time with young Paul Hope, but when Tracy allowed her to come down off the stage to slurp her tongue across the face of my giggling son, I couldn't help feeling anxious. Then Tracy led Sila away, and I began to feel foolish for my worries.

If there are any villains in this, they're surely the breeders who peddle wolf and wolf-dog pups. The vast majority of the nation's several thousand breeders, though, are not getting rich from their trade. Rather, they're small-time, low-income operators who've fallen in love with their wild, or supposedly wild, pets, permitted them to produce more pups than they can possibly afford to feed, and now have to sell some off.

At an Ely, Minnesota, research center, captive wolves give a tumultuous greeting to scientist L. David Mech. Animals are used for public education. The antlers came from a kill made by a pack of wild wolves nearby.

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It's just this kind of breeder I visit in Idaho, following up on a classified ad that offers four "100% Arctic Canadian Yukon Wolf Cubs . . . hand raised" and, of course, "great with kids."

On the consecutive days I visit the breeder's compound–a hot, half-acre, chicken-wire enclosure adjacent to a poor-looking trailer home with junked cars, deer ribs and washing machines strewn about–I'm accompanied either by Suzanne Laverty or Roy Farrar, executive director and president, respectively, of the Wolf Recovery Foundation, a group attempting to foster the comeback of wild wolves in that state. They know breeders' ways and can tell the difference between a wolf and a very wolf-looking dog.

On this 100-degree day, each of the 13 adult animals in the compound is short-chained to a stake in the barren ground and has only a slatted, fork-lift pallet for its shelter (the pups run loose in the driveway). All the animals have water in their five-gallon plastic pails but, because of tangled chains, some–including the mother of the pups–can't reach either their water or any shade. At least three of the four scrawny, 6-week-old pups have worms, Laverty points out.

Most of the animals are shy of us, wolflike, although a couple snarl and surge at chain's length, as if they'd like to get their teeth into our legs. It's clear, even to my inexperienced eye, however, that not one of these creatures is close to being a genetically pure wolf. The putative father of the pups we have come to see is big-footed and weighs more than 100 pounds, but his barrel chest, stocky legs, short muzzle and tail curved up over his back give him away as a wolf-malamute cross (about half malamute, Suzanne says).

He bit people only when defending her

Later, we get to talk with one of the owners. Yes, she says, the pups' parents and three other adults in the compound are guaranteed 100 percent wolf. Yes, she's heard tales of captive wolves and hybrids attacking people, especially children, but she's many times brought her own kids and grandkids into the compound–in strollers, no less–with never a nip, not even a growl. Indeed, her whole purpose in more than a dozen years of breeding has been to prove how finely wild wolves fit into human society, and she's evolved so successful a method of socializing the animals that not one in more than 300 pups produced has ever bitten a human. (Well, just one bit four people, but in every case he was personally defending her against intruders, former husbands and the like.)

But the best proof of her animals' temperamental stability is that she yearly gets repeat customers, three of whom are nationally known personalities (she wishes they didn't insist on anonymity) including a movie actor, a certain

Suzanne Laverty of the Wolf Recovery Foundation listens for wolf howls with a parabolic microphone.

California police chief and a prominent neurosurgeon.

We hear other, vibrant stories of how a "bonded" wolf will gladly fetch an owner's newspaper, slippers, even a beer out of the fridge; of how she got her first wild wolf in 1979 when an orphaned pup (its parents slain by poachers) followed her, like a child, out of the wilderness ("I couldn't very well leave it there to starve!"). When I speak with other breeders in following days, I discover that the almost mystical attraction of orphaned pup to breeder is by far the favored tale.

I begin to realize that what I am hearing is not so much a sales pitch (I've announced I'm a SMITHSONIAN writer, not a buyer) as a fantasy she has built up around her animals. I even feel a certain sympathy. But she and thousands of breeders like her continue to produce animals of which most will cause problems for society and early deaths for themselves. And the strikingly precise consistency of the breeders' stories can only make one wonder at the gullibility of buyers.

"It's 'Wolfitis,'" pronounces attack victim and former wolf owner Bob Duman. "There's a definite affliction that makes people buy and own these animals. In 'Wolfitis I,' you have a guy–these days he could be a yuppie, but more likely he's a guy who wears a leather jacket, has tattoos on his arms and drives a big Harley–who buys a wolf strictly as a status symbol. He wants you to know his animal can kill; and so can he, by extension.

"In 'Wolfitis II,' you have these naive, idealistic, natural types like my wife and me who see all the intelligent, wild and independent features of the animal, which totally blinds you to its shortcomings. It tears your house apart and you say, 'Oh, isn't that creative?' It starts act-

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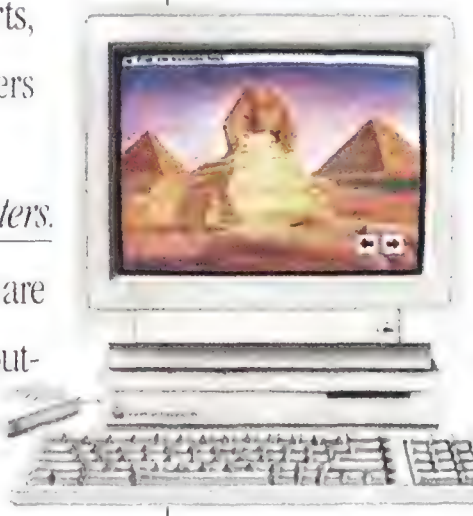

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ing aggressive toward some little kid in the neighborhood and you say, 'Oh, how perceptive of it, because that's a kid *nobody* likes.' Even when it bites you the first time you say, 'Oh, it didn't really *mean* to hurt me; it must've been something I did wrong to offend it.'"

Biologists who've been working for decades to ensure the return of the wild wolf are persuaded that private ownership of wolves and wolf dogs does nothing but harm. While wild-wolf packs are human-shy and feed by hunting down elusive, wild prey, the captive wolves and wolf dogs have neither the skills nor the pack structure to pursue wild prey. When they break loose–or when they're mistakenly "returned to the wilds" of a public park or forest by well-meaning owners who can no longer handle them–they typically seek food by pilfering campground garbage cans, growling campers away from their campfires and picnic tables, and attacking nearby livestock.

A bum rap for the wild wolves

"We're already battling centuries of ingrained prejudice against the wild wolf," says L. David Mech, U.S. Biological Survey scientist, chair of Minnesota's International Wolf Center and undisputed wild-wolf guru of North America. "So events like these are often generalized by the press or at least perceived in the public consciousness not as a 'captive-wolf incident' or 'wolf-hybrid incident' but simply as a 'wolf incident,' another reason to oppose the return of *Canis lupus*."

Wildlife biologists also worry about escaped or released wolf hybrids interbreeding with wild wolves–diluting their gene pool with the instincts and behaviors of domestic dogs. In 1990 the Wolf Specialist Group of the International Union for the Conservation of Nature (now the World Conservation Union) condemned private, captive ownership and breeding of wolves and wolf dogs, and urged immediate prohibition.

There is only one documented case in which a female wild wolf mated with a dog and carried dog genes back to her pack. "We don't know the statistical likelihood of this happening again," Mech says. "But it carries the potential for causing catastrophic changes in wild-wolf genetics. And the possibility becomes greater and greater, the more wolf hybrids there are."

There's no effective or fair way to reduce existing ownership of wolves and wolf hybrids. But experts agree that there are a few simple ways to minimize their appeal and put a massive crimp in their breeding and sale. First, all advertising and sale of animals with wolf blood should be prohibited. All states should legislate–as Connecticut, New York and a handful of other states now do–that an animal that is any percentage wolf be defined as a wolf, not as a dog, and be subject to the special educational or scientific permit required for wolf ownership.

What would happen, of course, is that most of the country's 100,000 captive wolves and 400,000 wolf hybrids would overnight become "dogs." Within the inner circle of passionate wolf and wolf-dog owners, the animals would continue to be sold. But breeder-sellers would no longer be able to advertise and sell to the general public using "wolf" as a come-on.

As an adjunct, the state permit sought by the handful of owners who elected to call a wolf a wolf should require the animal's containment within a proper, quarter-acre, chain-link-fence compound at least six feet high, topped by an additional four-foot width of inward-sloping, field-mesh wire (to prevent animals leaping or climbing out), with four feet of field mesh projecting underground inside (to prevent dig-outs) and another four-foot width of fine mesh extending up from the ground and surrounding the entire perimeter (at least four toddlers have lost limbs sticking them through chain link into wolf and hybrid pens).

This is the minimum area and kind of construction used at places like Mission:Wolf's home base in Colorado. The fencing prevents both escape and accidents; the size of the pen provides the animals with at least a little of the space they need (in the wild, after all, they may lope 40 or 50 miles in a day's time). Such a pen allows them to run and play–and to retreat from one another or from humans entering the pen. Much of the aggression captive wolves and wolf dogs exhibit, Weber and other caretakers maintain, is directly a result of their frustration at being confined in too small a space.

Give them a chance and they will come

A wild-wolf comeback is happening in a few of the lower 48 states. Minnesota now has from 1,900 to 2,000; Michigan and Wisconsin have a total of about 100; Montana has about 70, Idaho, possibly 10. The pack-hunting predators may be able to reinhabit the wilderness overpopulated by elk and deer in another half-dozen Rocky Mountain states, but somehow there's a distinct, statistical perversity in the fact that pure wolf pets in the lower 48 today outnumber wild wolves by a ratio of about 50:1.

"The wolf is the ultimate symbol of wilderness," Kent Weber reasons. "But over the past two decades, maybe since our first Earth Day, the average American has been made very aware that our wilderness heritage–his or her wilderness heritage–is rapidly being stripped away.

"And how do we respond? Some of us go out to crusade for wilderness. Some of us attempt to immerse ourselves in whatever wilderness remains. But most of us, especially since the 'me decade' of the 1980s, are conditioned to believe that we can somehow transform ourselves, our station in life, simply by buying and personally possessing something. And that's the appeal of wolf ownership–an antidote to vanishing wildness."

Onstage at Sabin Junior High School in Colorado Springs (right), Brooks and Weber introduce young Fenris–and argue that wolves belong in the wild, not in people's homes. Sila peers from a window (below) of the van in which she travels.

The story has changed somewhat

over the years as older generations of the family tell it to newer ones. But somehow no one ever gets too tired to tell it, or too bored to listen. In the end, it isn't so much that we're in the story; but that the story is in us.

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By Stephen May

Horace Pippin's art finds the grandeur in unheralded lives

His right arm wounded in World War I, he taught himself to paint as therapy; a major exhibition proves that it was a good move

Phillips Collection

Strolling along a street in West Chester, Pennsylvania, in the spring of 1937, art connoisseur Christian Brinton and famed artist N. C. Wyeth spotted an unusual, vivid painting in the window of a shoe repair shop. Clearly the work of an unschooled artist, something about its simplified forms, flattened perspectives and narrative content told them that this picture was special. Intrigued, Brinton looked up the artist, Horace Pippin, who lived nearby, and found he was a 49-year-old grade-school dropout, a self-trained black painter so severely wounded in World War I that he had to employ unorthodox methods to craft his pictures.

Brinton soon arranged to have two of Pippin's paintings shown in a local art exhibition, where they drew favorable responses. Immediately afterward, an exhibit of ten paintings and seven burnt-wood panels by Pippin at a black community center was widely publicized. Within a year, four paintings by the unknown "folk artist" were included in a group show at the Museum of Modern Art in New York City, and he was on his way to a successful career.

Although there are various versions of his discovery, there is no question that overnight Pippin catapulted from obscurity to national attention, blazing a meteoric trail across the art world. Regarding his images to be as accurate as photographs, he depicted each subject, as he put it, "exactly the way it is and exactly the way I see it." His vision was so intense that he painted mainly from memory and imagination. "Pictures just come to my mind," he once observed, "and then I tell my heart to go ahead." His evocative landscapes, vibrant still lifes, intimate interiors and compelling portraits reflect the experiences of a sensitive African-American whose outlook was shaped by traumatic events, exposure to life below the poverty line, and a strong affinity for his environment. Highly personal, unconventional, even eccentric, Pippin's work explores the cruelty of war, the warmth of family life, the everyday experiences of black Americans, the lives of American icons and the mysteries of religion.

Domino Players (1943) is one of a group of interior domestic scenes in which the artist evoked the warmth of his childhood years in Goshen, New York. Here, the boy sits at the table between two female relatives.

In part because he became difficult to categorize, Pippin is less well known today than his contemporary Grandma Moses (Anna Mary Robertson Moses), whose idealized, sentimental vignettes of a simpler, rural past remain enormously popular. Pippin deserves better. Now a retrospective of his work, "I Tell My Heart: The Art of Horace Pippin," comprising about 90 of his 137 known works and organized by the Pennsylvania Academy of the Fine Arts, is on national tour. It is at the Art Institute of Chicago through July 10, after which it will travel to the Cincinnati Art Museum (July 31-October 9), the Baltimore Museum of Art (October 26-January 1, 1995) and the Metropolitan Museum of Art in New York (February 1-April 30, 1995). A superb catalog, edited by exhibition curator Judith E. Stein, offers fresh insights into his art and places his oeuvre within the broad context of American art history.

That Pippin was able to achieve so much in so little

'Pictures just come to my mind'

time–he died nine years after being discovered–against such great odds, is testimony to his perseverance and artistic genius. There was certainly little in the first three-quarters of his life to suggest that he would accomplish much beyond the ordinary. As Pippin himself observed, he came to art the hard way.

Born in West Chester in 1888, Pippin was the grandson of slaves and the son of domestic workers. The family moved to Goshen, New York, when he was 3. His mother supported them by working as a laundress and domestic. By all accounts Pippin had a happy childhood, listening to his mother read Bible stories, hearing grim tales of the hanging of abolitionist John Brown and sketching the world around him. His artistic interests included drawing illustrations of words on spelling tests at his segregated, one-room school (which got him into trouble) and winning a prize in a magazine drawing contest at the age of 10.

Leaving school at 14, Pippin worked in a coal yard, a feed store and then, for seven years, as a porter at the St. Elmo Hotel in Goshen. Moving to New Jersey in 1912, he worked as a furniture packer (occasionally crating oil paintings) and as an iron molder in a foundry.

When America entered World War I, Pippin–age 29–enlisted in the Army. Shipped to France, he fought for many months in frontline trenches in the Argonne Forest with the celebrated 369th Infantry, a black regiment dubbed the "Hell Fighters" by awed German adversaries. The French awarded the entire unit the Croix de Guerre, a unique honor.

In one of the few autobiographical accounts by a black soldier to come out of the war, Pippin recorded his experiences in meticulous detail in inexpensive copybooks, illustrating his prose with colored-pencil drawings of gas-masked soldiers, marching troops, bunkers, exploding shells and aerial dogfights (above). Several of these sketches formed the basis for later oil paintings.

Archives of American Art, Smithsonian Institution

Fighting on the front lines in Argonne Forest during World War I, Pippin kept a journal in the trenches (above); these drawings inspired oil paintings such as *The End of the War: Starting Home*, 1930 (opposite).

Pippin's combat journals vividly document one doughboy's exposure to the cold, rain, gunfire, confusion and death on the Western Front. Often soaked to the skin, unable even to take off his shoes for 20 days at a stretch, oblivious to bursting shells ("I got so ust to them that I did not mind them at all"), fearful of German gas ("so thick it all looked Blue"), Pippin frequently lost track of the days. On one mission into no-man's-land, he reported, three of the ten members of his squad died in hand-to-hand fighting–but the unit killed nine of the ten attacking Germans.

And then his turn came. "I seen a machine gun nest [and] I got him," he recorded one day. But soon after that a bullet "cliped my neck and got me throu my shoulder and right arm," and he fell into a deep shell hole. Pinned down by sniper fire, Pippin lost so much blood that he was unable to move. Just as a French soldier came to the rescue, "a Bullet passed throu his head and he sank on me. . . . I could not get him . . . off me," Pippin wrote, although he was "glad to get his water and . . . Bread." After many hours in heavy rain, he was finally retrieved and placed on a stretcher, where he lay

Philadelphia Museum of Art

overnight, still exposed to the elements, before finally being evacuated to a hospital.

The war shattered Pippin both physically and psychologically. Returned to civilian life with a steel plate in his shoulder, his right arm virtually paralyzed and useless, he was ever after haunted by memories of life and death in the trenches.

In 1920 he married Jennie Ora Featherstone Wade Giles, a widow four years his senior with a young son. Moving into a modest redbrick row house on West Gay Street in West Chester, they eked out a meager existence. She took in laundry while he did light work and collected a small disability pension.

A bustling town set in rural Chester County, some 20 miles north of the Maryland border, West Chester had many Quaker abolitionists active in the Underground Railroad prior to the Civil War, earning the description of a "northern town with a southern exposure." In the 1920s its relatively large black population was segregated in restaurants, theaters, churches and grade schools, but ethnic and racial groups mixed fairly easily elsewhere in the small community. A tall, strong, gregarious man with a sense of humor, Pippin sang in a church choir, helped organize a Boy Scout troop and for several years served as commander of the local black American Legion post.

As therapy for his disabled arm and to help him through frequent bouts with depression, Pippin experimented with charcoal drawings on cigar boxes, which proved unsatisfactory. He then tried burning images on wood panels by holding a hot poker in his immobilized right hand, bracing that hand on his knee and maneuvering the panel against the smoking tip with his agile left hand. "It brought me back to my old self," Pippin said. For more than a dozen years he continued to create pictures by this laborious method, often enlivening the incised designs with touches of paint.

By the late 1920s his weakened right arm was sufficiently strong for him to take up oil painting, clasping a brush in his right hand and using his left hand to guide it across the canvas, a slow and painful process. Piling layer upon layer of pigment until he was satisfied, he worked for months on each panel in a small, ground-floor room of his house. Using inexpensive, available

Albright-Knox Art Gallery, Buffalo

Pippin, here in a self-portrait from 1941, taught himself to paint to strengthen his right arm, wounded in war.

materials such as house paint, he worked long hours at a makeshift easel under a single, unshaded light bulb.

The war, he recalled, "brought out all the art in me. I came home with all of it in my mind, and I paint from it today." It took three years–and at least a hundred coats of paint, he said–to complete his first oil painting, *The End of the War: Starting Home* (p. 51). A subdued panoramic view of German soldiers emerging from trenches to surrender to black American troops, one of whom lies bleeding on the ground, it suggests the devastation that war wreaks on victor and vanquished alike. Pippin enhanced the painting's grim impact with an elaborate, hand-carved frame punctuated by three-dimensional implements of war ranging from steel helmets and hand grenades to rifles and tanks.

The terror and trauma of his Army experiences came through in other early works such as *Shell Holes and Observation Balloon: Champagne Sector* (1931) and *Dog Fight Over Trenches* (1935). These renderings of his war experiences seemed to serve as a catharsis for Pippin. While friends and neighbors knew about his early artistic efforts, and he sometimes bartered paintings with local merchants or displayed them for sale in shops, few people took them seriously.

By 1935 he turned to other subjects. *Cabin in the Cotton I*, depicting a rustic home amid a sea of cotton, was the painting that opened the doors of the art world following its discovery by Brinton and Wyeth. Thanks particularly to Brinton's vigorous promotion of Pippin's work, his fame spread rapidly, aided by the national tour of the Museum of Modern Art show of 1938, "Masters of Popular Painting."

A major boost came when he acquired as his dealer the ebullient Robert Carlen of Philadelphia. Carlen provided quality art materials, generated ideas for paintings, organized gallery and museum exhibitions, and championed Pippin's work with institutions and collectors. For the artist's first one-man exhibition at his Philadelphia gallery in 1940, Carlen enlisted Dr. Albert C. Barnes, cantankerous art collector and founder of the Barnes Foundation (SMITHSONIAN, May 1993), to write the catalog introduction. Pippin's art, Barnes observed, was "distinctly American . . . [with] ruggedness, vivid drama, stark simplicity, picturesqueness and accentuated rhythms."

Even before the pictures could be hung on Carlen's walls, Barnes bought several; and Barnes' friend, actor Charles Laughton, purchased *Cabin in the Cotton I*. Many of the 22 paintings and five burnt-wood panels were sold, aided by a spate of strong reviews, including a short notice in *Time* magazine. In addition to Laughton, theatrical personalities who bought Pippin's works in the 1940s included John Garfield, Ruth Gordon, Clifford Odets, Claude Rains and Edward G. Robinson. In 1944 *Art Digest* reported that "theatrical people are Pippin's most ardent collectors and about 13 of them are standing in line for Pippin's next paintings."

By this time, spurred by Carlen's indefatigable efforts, collectors, dealers, galleries and museums from coast to coast were acquiring Pippin's paintings. His works were featured in one-man shows and in major exhibitions. "I believe," Barnes wrote in 1940, "that given the opportunity, he will become one of the most important painters of our age."

In 1939, Barnes invited Pippin to study at the Barnes Foundation in Merion, Pennsylvania, which he did briefly. While there is much speculation about how much influence exposure to Barnes' Impressionist and Postimpressionist holdings had on Pippin's art, he formed his own opinions about what he saw. "I learned a lot," he said, "but I'm going my own way." Henri Matisse, Pippin observed, "put the red in the wrong place." But he admired Pierre-Auguste Renoir's nudes and sun-filled canvases, saying, "I'm going to take colors out of that man's painting and get them into mine." Indeed, Pippin's palette brightened considerably thereafter.

Stephen May lives in Washington, D.C. and writes about American culture. His last article for SMITHSONIAN *was on Childe Hassam (December 1990).*

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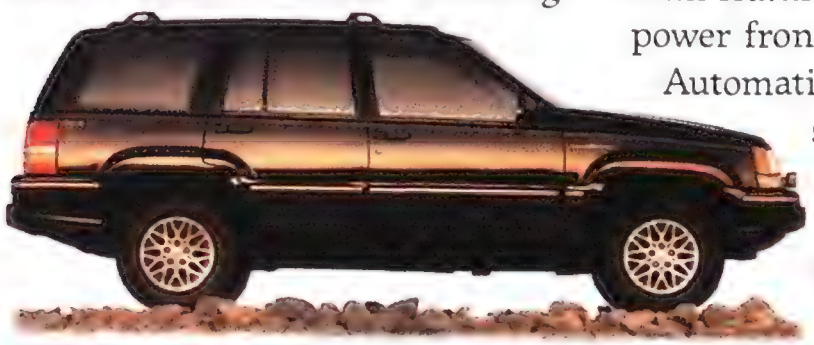

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At the same time, Pippin was, as fellow artist Edward Loper put it, a man whose military service had given him "lots of self respect. He knew he was strong. . . . [He] was the kind of black man who wouldn't take too much smart alecky stuff from other people." When Barnes tried to advise him on painting, Pippin reportedly responded, "Do I tell you how to run your foundation? Don't tell me how to paint."

Rural Chester County and the Brandywine Valley, which over the years inspired artists from Benjamin West and Thomas Sully to the Wyeths, also captivated Pippin. In *The Old Mill* (1940) he recorded a familiar local sight, as he did in a memorable series of seasonal images of the white-trimmed fieldstone exterior of the venerable Birmingham Meeting House, site of the Battle of the Brandywine. Pippin's special affection for the stone buildings, modest brick and wooden homes, and intimate atmosphere of his hometown came through in *West Chester, Pennsylvania* (1942), showing a cluster of row houses, and in *Harmonizing* (1944), set not far from his own house and depicting, among the quartet of singers, his stepson. His love of the outdoors–he was an avid fisherman and observer of nature–was reflected in deftly composed works depicting fishing, trapping, squirrel hunting, duck shooting and maple sugaring.

Nostalgic recollections of boyhood were evoked by the artist in *The Milkman of Goshen* (1945) and in *After Supper, West Chester* (c. 1935), in which the peaceful interaction among black and white youngsters presumably reflected the environment of relative racial harmony existing in both communities. "Given such childhood experience," writes art historian Judith Wilson in the exhibition catalog, "there can be little wonder at the adult Pippin's abhorrence of racial injustice, his confident re-

Pennsylvania Academy of the Fine Arts

In the powerful painting *John Brown Going to His Hanging* (1942) Pippin included his mother in the lower right corner, a silent witness facing the viewer. She grew up in Charlestown, Virginia, site of the hanging.

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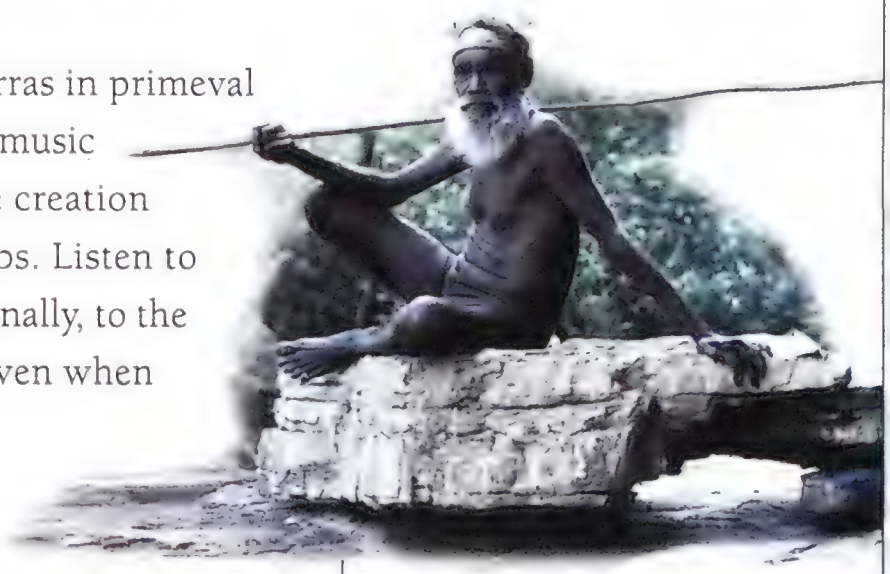

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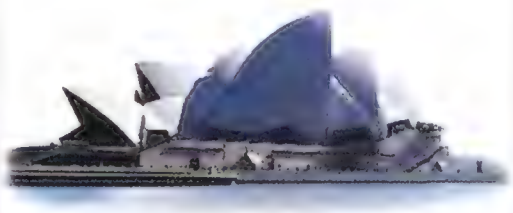

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One of Pippin's few symbolic paintings, *Mr. Prejudice* (1943) sees segregation weakening the wartime effort.

jection of myths of black inferiority, or his sympathetic portrayal of white subjects."

Recent study by Lynda Roscoe Hartigan, associate curator of painting and sculpture at the Smithsonian's National Museum of American Art, suggests that Pippin's love of gardening and freshly cut flowers in his home inspired his colorful, intricately designed floral still lifes and unpeopled interiors. Begun after his exposure to the Barnes collection, they include *Giant Daffodils* (p. 58) and *My Backyard*, a view of the small plot he and his wife maintained and where he often painted, and numerous pictures of vases filled with brilliantly hued roses and other blooms they may have grown. "Whether a still life features an unpretentiously potted cyclamen or a casual bouquet of roses dressed up by a vase," Hartigan writes in her catalog essay, "the dignity of detail granted to each petal, blossom, and leaf reflects the knowledge and spirit of a gardener's touch rather than scientific scrutiny or self-conscious pictorial research and emulation." According to Pippin biographer Selden Rodman, when the artist's charming, perhaps autobiographical *Victorian Parlor* (1945) was praised as a still life, he protested. "*Still* life? That's no still life," he said. "If you look carefully you'll see that She's left her knitting, and He's left his pipe. They'll be back any moment."

Fellow painter Romare Bearden once recalled that, when he met Pippin, he was struck by "how positive he was that his paintings were completely realistic." Bearden suggested that his distortion of perspective and deviation from objective reality grew out of the "conception which Pippin already had in mind." As Pippin himself said, "The pictures . . . come to me in my mind, and if to me it is a worthwhile picture, I paint it. I do over the picture several times in my mind, and when I am ready to paint it I have all the details I need." As if in defense of all self-taught artists he added, "My opinion of art is that a man should have love for it, because . . . he paints from his heart and mind. To me it seems impossible for another to teach one of Art."

Domestic scenes from his own life

The artist's heart and mind were very much evident in his group of intimate glimpses, drawn from his own experiences, into African-American domestic life in the North. Typically set in modest rooms, they depict several generations engaged in cooking, eating, bathing, praying, sleeping and playing games. In paintings such as *Saying Prayers* (1943) and *Saturday Night Bath* (1945), drab walls with cracked plaster and tattered curtains contrast with brightly colored rugs and the clothing of mothers and children.

In Pippin's most ambitious and successful interior narrative, *Domino Players* (pp. 48-49), two women play dominoes on a kitchen table, while a boy (Pippin said it was himself) looks on, and a third woman off to the side makes a quilt next to an iron stove. It is a solemn, timeless scene enlivened with balanced, intricate designs as horizontal floorboards contrast with vertical table legs and a stovepipe, while the staccato black-and-white domino dots resonate in the blouse of the central figure and the salt-and-pepper hair and black-and-red cap of her opponent. To collector Duncan Phillips, who bought the painting, *Domino Players* represented Pippin's "very intimate expression of Negro thought and imagination. . . . I feel he pours his greatest emotion [into] and has more unique vision" in such works.

Pippin's seven formal portraits convey not only how he saw his subjects but what he felt about them. His first, a soberly balanced, somewhat larger-than-life likeness of his small, hardworking wife, captures her no-nonsense persona. Two portraits of singer Marian Anderson suggest the radiant monumentality she projected when he heard her sing outdoors in Philadelphia in 1940. He painted two self-portraits, showing himself in 1941 casually working at his easel (p. 52) and in 1944 in a dignified close-up. Each depiction suggests a confident man at peace with the world.

Nowhere is Pippin's intensity more apparent than in

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Giant Daffodils is one of several vivid paintings from the 1940s that reflect the artist's love of gardening.

his historical tableaus of Abraham Lincoln and John Brown. In four paintings executed between 1934 and 1944, Pippin focused on Lincoln's humble origins and humane generosity. He depicted Brown, the messianic abolitionist crusader, in three roles: as youthful religious zealot, wounded martyr on trial and noble stoic headed for the gallows. *John Brown Going to His Hanging* (p. 54), somber-toned and elaborately patterned, evokes the grim day in December 1859 when Brown, arms bound to his sides and seated on his own coffin, was driven through the crowded streets of Charlestown, Virginia (now Charles Town, West Virginia), on his way to execution. The bleak scene is intensified by a frowning black woman who stands out in her blue-checked dress. Pippin said it was his mother who, according to family legend, witnessed the hanging. "Pippin's implication that *he*–via a blood relative–was part of this historic event," observes art historian Richard J. Powell in a catalog essay, "demonstrated his deep sense that the shifting tides of history *did* impact profoundly upon him as well as other black Americans."

A deeply spiritual man, Pippin looked to religion both for sustenance and as a source of themes for several heartfelt paintings. He once explained, as fellow artist Julius Bloch recalled, that "he came to paint because of loneliness . . . but his talent came to him from God, who directs his work and when he has difficulty with it, he prays at night, and the next morning help comes and the problem is clearer and nearer solution."

According to Powell, some of Pippin's religious works were inspired by mass-produced pictures common in black churches and homes of the period. In *Christ (Crowned with Thorns)* (1938), however, he created a haunting, sophisticated likeness reminiscent of Renaissance images.

'Holy Mountain' echoes biblical prophecy

His response to World War II is reflected in his distinctive, thought-provoking "Holy Mountain" series of three paintings (a fourth version was never finished). Prompted in part by seeing self-taught Quaker artist Edward Hicks' "Peaceable Kingdom" paintings in Carlen's gallery, the series was also rooted in Pippin's knowledge of the Bible and current events. "The world is in a Bad way at this time," Pippin wrote. "I mean war. . . . There is trouble every place you Go today. Then one thinks of peace . . . yes there will be–peace. . . ."

Drawing on the biblical prophecy (Isaiah 11:6-10) of world peace, in these works Pippin juxtaposed an idyllic gathering of a black shepherd, children and animals against a forested backdrop with silhouetted images of falling bombs, soldiers on the move, tiny white crosses and a hanged black man. The lively, brightly painted boy and beasts in the foreground, beautifully contrasted with the deep green foliage, exude a sense of harmony, but the ominous background suggests Pippin's awareness that the horrors of overseas war and domestic lynchings and prejudice posed constant threats to this peaceful vision.

Despite Pippin's increasing national reputation and success, he and his wife maintained a low-key lifestyle in the little house on West Gay Street. Dubious about the durability of their prosperity, his wife continued to take in washing, much to Pippin's chagrin. He remained devoted to her, his art and his community. "He was just an ordinary man to us," a neighbor, 95-year-old Benjamin Lampkins sr., recalled recently.

As his "Holy Mountain" themes suggested, in the 1940s Pippin the veteran was worried about the renewed violence of war, a concern that increased when his stepson joined the Armed Forces. As a black man, he was concerned about the persistence of racial prejudice in a country he had defended at such high cost. Although he supported America's war effort, he was torn by contradictions inherent in the nation's defense of freedoms that were denied African-American citizens. In his only overt statement about racial discrimination,

Mr. Prejudice (1943), he inveighed against those seeking to foment divisions in both the military and defense industries. In this somewhat awkward but powerful polemic, the ugly title figure drives a wedge into the V-for-Victory sign, while a sinister Ku Klux Klansman and slavemaster stand by to help. They are surrounded, however, by such symbols of good as a black Statue of Liberty, black and white war industry machinists and an integrated group of G.I.'s from both wars. Balancing the white-hooded Klansman with a white-robed surgeon, the artist suggested how racial bigotry threatened the wartime unity necessary for victory.

For all his fame, relative financial security and good fortune, Pippin seemed deeply troubled, almost grieving, by the mid-1940s. He was lonely and constantly beset by the "blue spells," from which painting provided only temporary solace. During frequent visits to the neighborhood bar to buy drinks and sandwiches for his friends, he often boasted about his successes, and there were rumors about fancy lady friends. The mental instability of his devoted wife, who was committed to a state institution in early 1946, heightened his depression.

Pippin's final finished painting, *Man on a Bench* (below), shows a lonely, older black man slumped dejectedly on a red park bench framed by dark woods in which a squirrel munches on a nut. Most likely it is a psychological self-portrait of a man who, for all his dazzling success and sudden celebrity, has found himself aging, alone and unhappy. It "symbolizes Pippin himself," Bearden concluded, "who, having completed his journey and his mission, sits wistfully, in the autumn of the year, all alone on a park bench." "The effect of the picture," said playwright Clifford Odets, who once owned it, "is of . . . deep despair."

In the summer of 1946, after returning home late from a night at Little Joe's Tavern, just down the street, Pippin died of a stroke. He was only 58. His wife died two weeks later, unaware of his passing. On his grave in Chestnut Grove Annex Cemetery on the edge of West Chester, a simple stone marker proudly proclaims: "Horace Pippin / 1888-1946 / Pfc Co. K-369th Inf. / World War."

The last painting that Pippin completed, *Man on a Bench* (1946) is regarded as a spiritual self-portrait. His earlier successes paled into loneliness after his wife, suffering from mental illness, entered a hospital.

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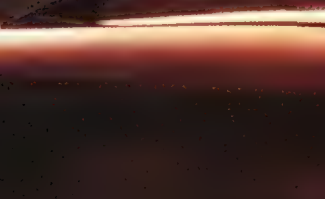

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The Hubble Space Telescope captured images of the "string of pearls" as the comet fragments streaked toward Jupiter. Opposite, computer image shows how planet's atmosphere might ripple from comet's impact.

By David Levy

Collision course! a comet is bearing down on Jupiter

When Comet Shoemaker-Levy 9 smashes into the giant planet in July, it could cause the 'biggest bang' ever seen in our solar system

This July, every major telescope on Earth, as well as the Hubble Space Telescope and an array of other orbiting instruments, will be trained on the planet Jupiter. Their purpose: to record the most cataclysmic event observed in our solar system since the dawn of civilization–the collision between the giant planet and Periodic Comet Shoemaker-Levy 9. Over a period of six days beginning July 16, huge pieces of the comet, agglomerations of dust, rock and ice perhaps as large as three miles in diameter, will slam into Jupiter at a speed of 134,000 miles per hour, with effects on the planet–and for that matter, implications for the long-term future of our own planet–that remain to be seen.

The first inkling that such an event would take place came in March of 1993. I am a comet hunter; over the past ten years I have discovered or participated in the discovery of 20 comets (SMITHSONIAN, June 1992). Although I am not a professional astronomer, I frequently work with two noted professionals, Carolyn and Eugene Shoemaker, who specialize not just in comets but also in certain asteroids whose orbits bring them so close to Earth that they present a potential danger. That March, I joined the Shoemakers and French astronomer Philippe Bendjoya at the 18-inch Schmidt telescope on Palomar Mountain.

Our past two trips to Palomar had been frustrating. In January, of the seven nights we spent at the telescope only one was clear. A trip in February was even worse–during the entire week we were able to observe for less than an hour. On this trip, though, we seemed to be in luck. On our first night, the sky was sparkling. We loaded our instrument with film, took an eight-minute exposure of a region of the sky, then moved on to a second region and shot again. All went well until Gene developed the first film. It was absolutely black. Since we had last observed, someone must have opened our box of films, exposing them to light.

We had other film, but we hadn't yet prepared it with a six-hour exposure to a specially mixed gas that makes our films hypersensitive to light and thus able to probe deeper into the sky. Faced with losing the first clear night in three months, Gene developed a blank film taken from the middle of the box. Its edges were

black, or exposed, but the center was reasonably clear and usable. Perhaps all was not lost after all. We forged ahead as planned that night, using all but a dozen or so of these films. The following day Gene prepared new film, and we began the second night with a good sky and good film.

Our observing was cut short again when light clouds wandered in. I wanted to continue anyway. "Gene," I said, "we've been clouded out so much, why don't we just keep on going?"

Gene disagreed. "We've got to watch the bottom line. We spend almost four dollars for each piece of film we shoot. We can't waste an exposure when there is this much cloud in the sky."

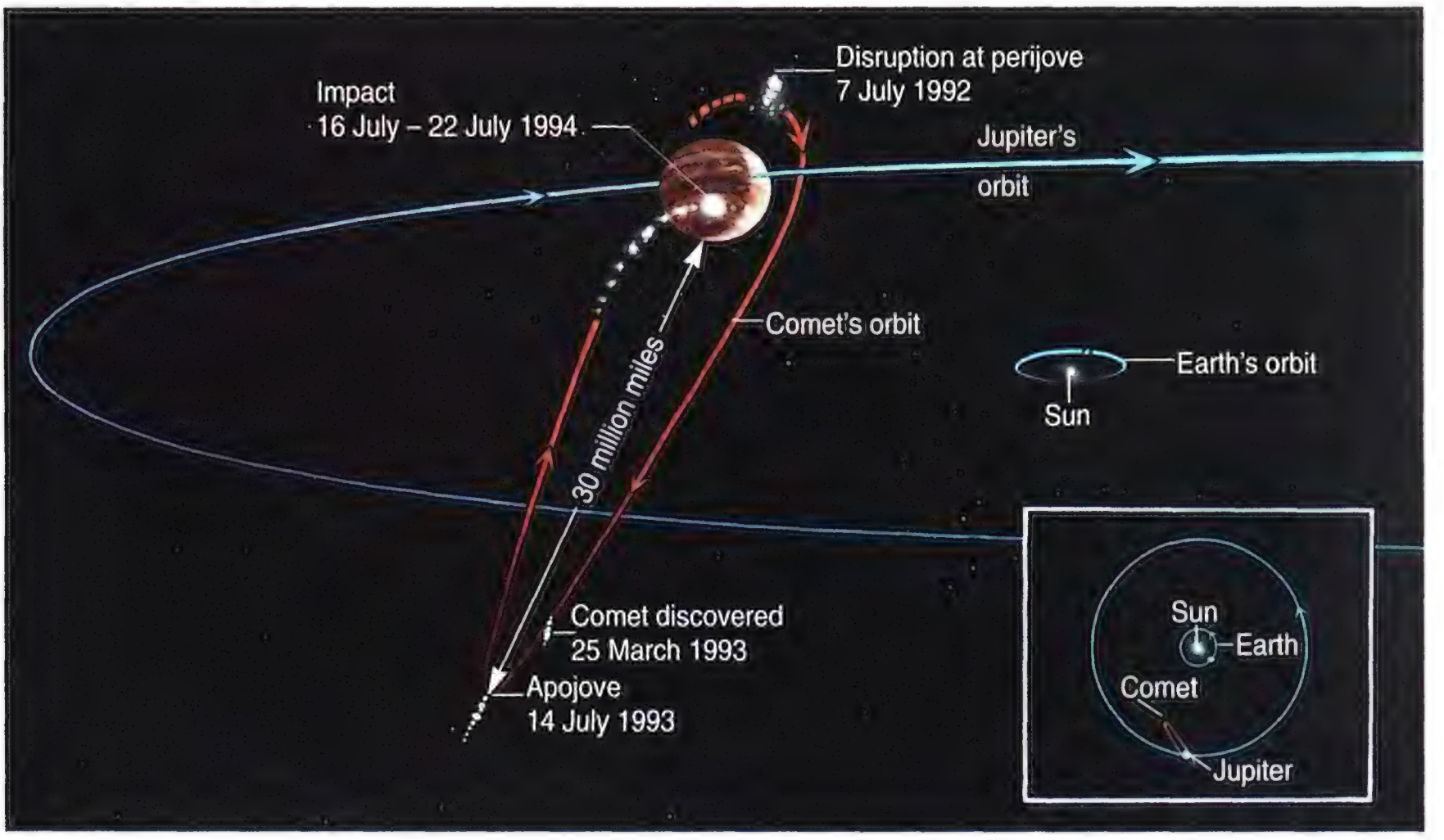
Gene, Carolyn and I stood around for a few minutes, looking forlornly at the gathering clouds. But it still didn't seem that bad. "Gene," I tried again, "don't we have some of those light-struck films left?" We looked at each other, then at the sky. "Let's get to it!" Gene said. We raced back to the dome, loaded the telescope and pointed it to the next field on our list. When I looked through the eyepiece, the bright glow told me that Jupiter was not far away and would be in the picture.

When we are looking for moving comets or asteroids, we have to take two films of every field of sky. Then Carolyn scans the films using a stereomicroscope. In the 3-D view, moving comets seem to float above the background of distant stars.

But I had trouble getting that second, matching film as the clouds thickened. Finally, after two hours, a clear patch came along, and I took the badly needed second exposure. Soon the clouds came in for good.

March 25, 1993, dawned cloudy, and by 4 P.M. the first flakes of a snowstorm were falling. Carolyn was almost finished scanning; she had seen nothing new on the first night's films. Suddenly she sat up in her chair and looked intently into the eyepieces of the stereomicroscope. "This looks like a squashed comet!" It looked like a comet, all right, but instead of the nice round coma, or head, that comets should have, this one looked like a bar. What's more, in the 1 hour 49 minutes between films the object had moved only slightly. "The image is most unusual," we reported to Brian Marsden, director of the Smithsonian's Central Bureau for Astronomical Telegrams, which announces astronomical findings to the international community. "It appears as a dense, linear bar very close to 1 arcminute long, oriented roughly east-west. No central condensation is observable in either of the two images."

Since we were hopelessly clouded out that night, I telephoned Jim Scotti, who was also searching for asteroids and comets using the 36-inch Spacewatch telescope



Shoemaker-Levy 9's last orbit: after close encounter that tore it to pieces on July 7, 1992, the comet sped 30 million miles into space before curving back to strike Jupiter this July. Orbits are not drawn to scale.

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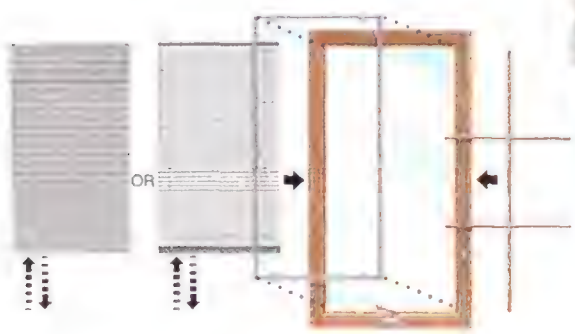

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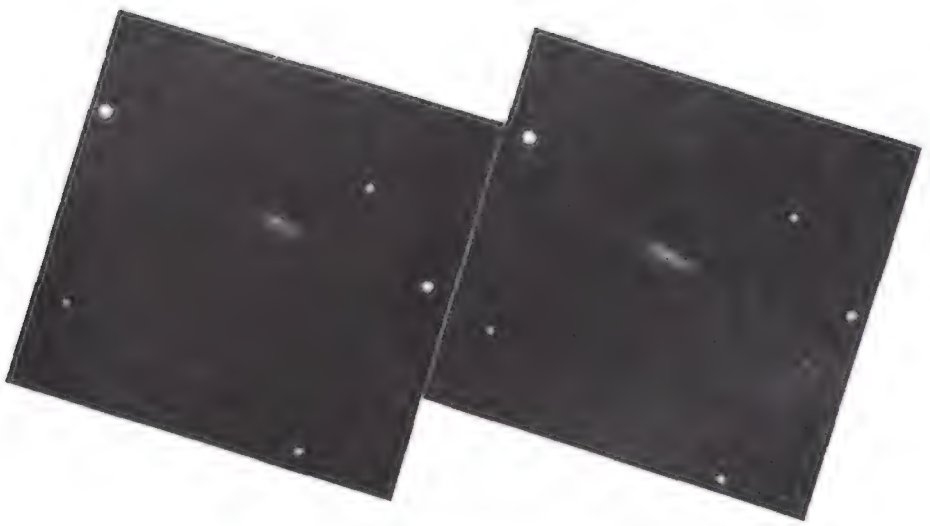


Films shot two hours apart by the Shoemaker-Levy team showed moving object, thus leading to comet's discovery.

at Kitt Peak in Arizona. The comet sounded so strange that he doubted it was real. Besides, he went on, "it is moving just like Jupiter, in the same direction and at the same speed." We had been fooled before. This time, our eyes told us the object was real, but our minds said it wasn't. Two hours later I called Scotti again.

"Just a minute," he began. "That sound you heard is me trying to lift my jaw off the floor. Have *you* got a comet!–or should I say comets! There are at least five separate comets in a train!"

On March 26 Brian Marsden announced the discovery of this bizarre new member of the Solar System. And soon observations were coming in from all over the world. High atop Hawaii's Mauna Kea, David Jewitt and Jane Luu thought that the comet looked like a string of pearls. They also reported that the comet consisted of 17 separate comet nuclei, a number they later revised upward to 21.

On May 22, 1993, Gene and Carolyn and I were at the 18-inch telescope, getting ready for a night's observing (during which we would discover another new comet, Shoemaker-Levy 1993h). I checked my electronic mail to see if anything new had recently appeared in the sky, and found a stunning announcement from Brian Marsden: "This particular computation," the circulars read dryly, "indicates that Delta J will be only 0.0003 AU [Jupiter's radius being 0.0005 AU] on 1994 July 25.4." Translation: the ancient comet would have only one orbit left, a farewell chance to swing away from Jupiter for a time, and then return to crash into the planet.

By now, astronomers were beginning to piece together the comet's history and the strange events leading up to the collision. According to one scenario, around 1858, when Abraham Lincoln was debating Stephen Douglas, far out in space a comet was beginning a century-and-a-half-long dance with Jupiter. The comet was orbiting the Sun, as comets do, when its path brought it near the giant planet. There is nothing unusual about this; Jupiter is almost unimaginably huge, some 88,000 miles in diameter, vast enough to hold 1,300 Earths, and its powerful gravitational field affects everything that comes near. Halley's comet once took millions of years to orbit the Sun, but after repeated encounters with Jupiter's gravitational field its orbit was shortened to 76 years, thus allowing most of us to enjoy this comet once in our lives.

Periodic Comet Shoemaker-Levy 9's encounter with Jupiter was more drastic. Once a satellite of the Sun, it was captured by the planet and became Jupiter's satellite. Its orbit eventually took the shape of a long and narrow loop with its farthest point, or apojove, lying some 30 million miles from Jupiter. Every two years or so it would reach its closest point, or perijove. Sometimes these perijoves lay perilously close to the planet.

By the summer of 1992, the comet's gentle ballet with Jupiter had become a dance of death. Tumbling closer and closer, on July 7 the comet schussed past only 20,000 miles from the top of the planet's churning mass of clouds. Jupiter's gravitational embrace proved catastrophic. The comet began to fall apart.

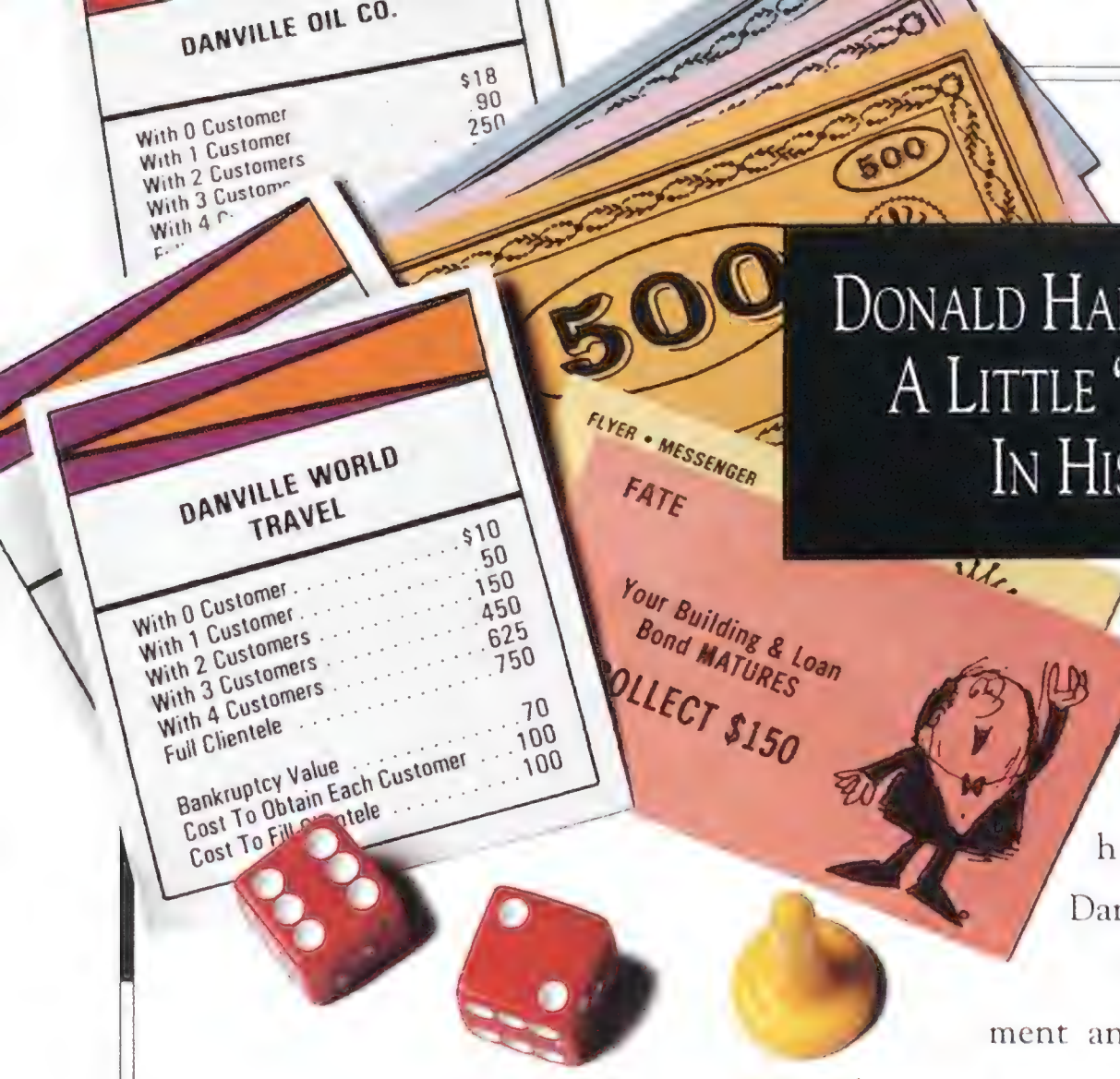
The event went unmarked on Earth, for Jupiter was on the other side of the Sun and not visible in the night sky, and so it was not until we discovered the comet some nine months later that astronomers could begin reconstructing its history.

In the four-and-a-half-billion-year lifetime of the Solar System, things have gone bump in the night quite often, and Earth itself has by no means been immune from collisions with comets and asteroids. In recent years dozens of impact craters have been identified, some of them enormous. In central Quebec there is a crater 60 miles across where something hit Earth 212 million years ago. According to one prominent theory, the impact of a comet or asteroid 65 million years ago threw up such a cloud of dust that it blocked the Sun for years and eventually brought about the extinction of the dinosaurs.

Nobody knows more about this than Gene Shoemaker, whose own orbit has revolved around such impacts. His PhD dissertation proved that the mile-wide crater east of Flagstaff, Arizona, was the result of the impact of an asteroid some 160 feet in diameter. Since then he has studied impact craters on the Moon and sought them out on Earth as far away as Australia. "I've seen the objects, and I've seen the resulting craters," he says. "I had always wondered what it would be like to see a comet crash take place."

Shoemaker realized that Jupiter, with its enormous gravity, was more likely than Earth to pull in a comet. In

The Quest for Comets, *David Levy's new book, concerns both the hunt for comets in space and the search for their impact craters on Earth.*



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Above, mile-wide crater in Arizona was caused by an asteroid only 160 feet in diameter. At left, an ancient comet's collision with one of Jupiter's moons, Callisto, produced string of craters 370 miles long.

fact, he believes that at least one comet is probably in a temporary orbit about Jupiter at any given time. But at some 500 million miles from us, such a comet would normally be much too faint to see. We usually learn about comets orbiting Jupiter only after they have left its sphere of influence and have come close enough to Earth to be discovered. Other comets have fallen into orbit about Jupiter for a brief time and then resumed a more normal orbit about the Sun.

Shoemaker estimates the likelihood of a comet in the size range of ten kilometers in diameter crashing into Jupiter as once in about a thousand years. He bases this on his intensive study of Jupiter's cratered moons Ganymede and Callisto, which may bear the scars of other comets that suffered the same fate that confronts Shoemaker-Levy 9.

On Callisto lies a chain of craters more than 600 kilometers long. Named Gipul Catena, it is one of 13 that have been found on Callisto; 3 others exist on Ganymede. Since these chains were first revealed on Voyager images in 1979, astronomers have wondered how they could have been formed. Shortly after Shoemaker-Levy 9's discovery, Jay Melosh of the University of Arizona and Paul Schenk of the Lunar and Planetary Institute in Houston, Texas, saw the comet's string-of-pearls appearance and made the connection. A comet brushes by Jupiter, falls apart and slams into Callisto a few days later. Shoemaker-Levy 9's fate is different. While these other comets had hours or days after breakup to live, the present comet has had two years for the fragments to spread apart. Instead of its fragments hitting within seconds of one another, it will self-destruct over a period of six days as it falls into the grasp of the planet from hell.

Beneath dense layers of ammonia clouds crackling with lightning and intense radiation, Jupiter is made up primarily of fluid hydrogen heated to a temperature of 20,000 degrees C at the core. Its surface is ravaged by hurricane-force winds and violent storms–one of them, the Great Red Spot, large enough to encompass two Earths, has been raging for at least 300 years.

As the comet approaches in early July, its vanguard of dust and debris will put on a celestial fireworks show that, if we could travel to Jupiter and see it there, would dwarf any meteor shower ever seen on Earth. For an hour or so every night, a Jovian observer would see a startling number–perhaps millions–of meteors. Behind them in the sky would appear a train of comets that brightens with each passing night.

On July 16, fragment A (the pieces are lettered "A" to "W," leaving out "I" and "O" to avoid confusion with "one" and "zero") will approach Jupiter at an angle of about 45 degrees from vertical, about 10 degrees south of the latitude of the Great Red Spot. As it encounters Jupiter's stratosphere, it will flatten out like a pancake. Plunging through the atmosphere at 37 miles per second, fragment A will start to slow down as it slices through Jupiter's clouds in a tunnel of fire the size of Arizona. Within seconds, the comet will explode in a blinding flash of light as ten million megatons of energy are released. A plume consisting of part comet and part

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planet material, according to one estimate, will quickly rise upward through the atmosphere and emerge out the cloud tops. The whole planet will shudder imperceptibly and ring like a bell, and within a few minutes the light will fade away. The mythical Jovian observer could then look back to the sky again and see 20 more comets lined up like planes waiting to land, each one ready to put on a show as big as or bigger than the first.

Fragment Q, itself broken into pieces, is the biggest. Twenty-five years to the day after humans first walked on the Moon, it will follow its kin to destruction at Jupiter. While Washingtonians enjoy a fireworks display on the National Mall to celebrate the Moon landing, fragment Q will probably make the largest explosion witnessed in our solar system since the beginning of recorded history. Also by that time, dust particles in Jupiter's magnetosphere (an intense magnetic field surrounding Jupiter) will be so charged from the attack of the earlier comets that it is possible that the magnetosphere will glow and be briefly visible from Earth.

According to some wild initial speculations, were the comet to hit on the side of Jupiter facing us, the planet would become visible in broad daylight as something brighter than the full Moon, as a billion megatons of energy were released. But those numbers and predictions have grown more conservative as comet astronomers, astrophysicists and researchers in related fields have gathered in a flurry of meetings to compare notes and coordinate observations of the comet before its impact and the subsequent effects on Jupiter.

The truth is that we really don't know what is going to happen. No one has ever seen an explosion this large on a major planet before. And because comet crashes have such a bearing on the history, and possibly the future, of our own planet, we want to learn everything we can about this one. For each of 21 impacts, we will watch for the following:

- The fireball: although the actual strikes will occur on Jupiter's night side, which faces away from Earth, the Galileo spacecraft is in a unique position to observe them. As a fragment plunges into Jupiter's atmosphere, it will light up like a giant meteor that could be as bright as the planet itself.
- The plume: according to Caltech's Thomas Ahrens, each fragment will create a cone of fire as it plows its way through Jupiter's clouds and heats the surrounding gases to tens of thousands of degrees. The tunnel will be completed in a few seconds, after which the comet, beset by exponentially increasing pressure, will disintegrate. A gigantic plume will fire back through the tunnel and emerge out of Jupiter's cloud tops. Another researcher suggests that Jupiter could simply gulp down each fragment without a trace, and a third scientist predicts a massive ejection of material consisting of both comet debris and gases from Jupiter that would arc upward and fall in again over thousands of kilometers. As the material falls back toward the planet, water could condense in Jupiter's stratosphere. How these clouds circulate through the atmosphere could give astronomers a clue as to how the wind patterns in the upper atmosphere work, and the altitude at which the clouds form could reveal something about what they contain.

Although we won't be able to see the bright flashes from Earth, we might see them reflected off Jupiter's inner moons if the moons are behind Jupiter but still visible from Earth. They will be brightest from Io, one of Jupiter's closest moons. The flashes will be brief, and not easily notable through small amateur telescopes unless a moon is in eclipse at the time of impact.

Seismic and atmospheric waves could resonate

Artist's rendering based on a computer simulation shows view from the top of Jupiter's cloud banks. The night sky is ablaze as meteors fly in all directions, and comet fragments begin to bombard the planet. At left, large pieces of the doomed comet streak down in formation and start to break up. At the far left, distant moon Io is slightly illuminated by explosions.

around Jupiter more than a day after each impact. A shock wave will invade Jupiter's interior and get bent back like the seismic waves that follow earthquakes. Although the shock wave, which might last for several hours, will be hard to observe, it could teach us much about how Jupiter's insides are structured. Also, it might be possible to detect atmospheric ripples as they occur over several days.

The long-term effects are even more difficult to predict. It is possible that the force of Shoemaker-Levy 9 will cause material from Jupiter's interior to gush upward in a series of small storms that could last as long as several weeks. Also, the dust could produce a haze over a part of Jupiter that could obscure some details of the belts and zones we usually see.

When Voyager 1 passed by Jupiter in 1979, it recorded a fragile ring that straddles the planet, a ring so thin that it is barely possible to see it from an Earth-based telescope. As the onrushing comets plunge toward Jupiter, they are expected to leave huge amounts of dust that will contribute material to this ring. Over the next several years, the ring could strengthen considerably, although it will not approach the beauty and complexity of the system around Saturn.

Since the crash provides the opportunity of a lifetime, almost every major observing facility in the world will be focused on it, from the mighty 200-inch atop Palomar Mountain to the Wise Observatory in Israel to Queensland, Australia. The newly repaired Hubble Space Telescope is imaging the comet fragments on a regular basis and will monitor Jupiter with high-resolution pictures during the week of impacts. From Tucson, Arizona, Stephen M. Larson has developed CINE, the Comet Impact Network Experiment, which will use telescopes in both hemispheres to observe the comet as it approaches Jupiter. By using a coronagraph to block out the blinding light from Jupiter, Larson's program might be able to study the in-falling comets until they are about to strike.

More than any other single event since the invention of the telescope, the crash on Jupiter will focus a massive amount of instrument power around the world. Amateur astronomers will train their telescopes on Jupiter to see if anything has changed on the planet they know so well. As for the rest of us, we might rather not contemplate the fact that if a comet like Shoemaker-Levy 9 were to encounter our own planet, it could mean disaster for many species, including our own. This time, fortunately, instead of worrying about a catastrophe in this world, we can observe one in another.

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mention that the '94 Suburban is big enough to seat nine passengers? Did we mention they'll be able to luxuriate in available custom leather seating surfaces? Or that Suburban can stow up to 149.5 cubic feet of "stuff" in its cargo space? We hope we didn't overlook anything. Then again, the '94 Suburban is pretty hard to overlook.

Chevy Suburban
LIKE A ROCK

By David M. Schwartz

Over hill, over dale, on a bicycle built for . . . goo

On your trusty all-terrain two-wheeler, you can mush through mud or climb a peak–but there's trouble afoot in the land of the mountain bike

Many state and national parks bar bikers from narrow paths. Riders protest, but hikers strongly support ban.

After a night of gentle rain, the sun poked through the fog and the Marin Headlands sparkled. The cool winter air had a palpable smell of freshness, and Linda Enis was gulping plenty of it as she pedaled the Coyote Ridge Trail of the Golden Gate National Recreation Area on her mountain bike. Cresting the ridge and descending to a fire road above the bluffs, she spotted two hikers ahead. A fit and agile 49, Enis could have hunkered into a good coasting position, but she braked to a discreet speed and called out a greeting. "Hi! What a beautiful day!" If you've ever spoken with Linda Enis, even for a minute, you would hear the goodwill and enthusiasm ringing in her voice.

They were not returned.

"Get off your bike and smell the flowers," snarled one of the hikers, her face twisted with anger. Those were fightin' words, and they practically knocked the remaining wind out of Enis, who was too astonished to respond.

Fightin' words all right, but just a small skirmish in the Marin County mountain bike war. In these Elysian hills and the surrounding countryside north of San Francisco, tensions between bikers and hikers have been mounting since the early 1980s, when the all-terrain bicycle–or mountain bike, as it came to be called–began to steal the heart of the cycling public.

The beauty of a mountain bike is its go-anywhere grace: Marin County's Linda Enis splashes across a stream.

Whether hopping a log in the woods or a pothole in the city, the new generation of lightweight bikes with wide, resilient tires absorbed the insults of uneven ground and conveyed their riders in upright comfort, offering them a forgiving seat and gears that clicked smartly into place with the flick of a thumb. Suddenly, thousands of people who hadn't pushed a pedal since the bike boom of the '70s were buying user-friendly mountain bicycles that could go anywhere.

Which was precisely the problem. Many of the places they went were already occupied by people who preferred their outdoor experience unpolluted by the flash of metal or the fear of collision. To traditional trail users, the new breed of bicycle was alien and dangerous, esthetically offensive and physically menacing. "What cars are to road bikes, mountain bikes are to hikers and equestrians," asserts Connie Berto, a Marin County equestrian who has had several close encounters of the bicycle kind in the backcountry. Even worse, claimed the conservation-minded, the bikes' knobby tires damage trails and cause erosion.

And so, as fleets of the versatile two-wheelers began rolling out of bike shops and onto trails, the boot-and-bridle crowd cried "Invasion!" In California's Marin County, whose vast preserves make it a mecca for the Bay Area's large population of outdoor enthusiasts, intense hostilities broke out and quickly heated to a rolling boil that has refused to cool. Anti-bike forces flexed organizational muscles toned during two decades of fighting land developers, this time aiming their

Photographs by Gerry Gropp

Gary Fisher made this prototype from scavenged parts in 1974; today he heads mountain-bike-producing firm.

political fists at off-road cyclists and their right to ride. They lobbied land management agencies for regulations banning bikes from narrow trails, or "single-tracks," as the paths are lovingly called by bikers. At rancorous public meetings where invective flew faster than an out-of-control cyclist on a hairpin turn, both sides fought for their recreational lives. Every week, the op-ed pages of newspapers screamed out headlines like "Cyclists Are Out of Control," "Environmental Rape" and "Hikers, Bikers On a Collision Course." In one Sunday edition, the *Marin Independent Journal* ran a lead editorial appealing for a truce and offering one of the newspaper's meeting rooms for "peace talks."

But peace was not given a chance. Foes of the bicycle onslaught, older and better-connected, won most of the battles, and signs picturing a bicycle crossed by a red slash began to appear at trailheads all over the county. With rare exceptions, mountain bikes were confined to fire roads–unpaved freeways, in the minds of those who covet rugged single-tracks for their isolation and challenge. Even on the fire roads, the cyclists suddenly became subject to speed limits of 15 miles per hour and $200 fines enforced by rangers recruited to quash the two-wheeled menace.

Although few places have seen such intense firepower brought to bear, public lands around the country have become contested turf. Many state park systems have banned bicycles from narrow trails. National parks prohibit them, in most cases, from leaving the pavement. In New York's Central Park, authorities invoked a long-ignored rule that predates the mountain bike era to crack down on cyclists riding dirt paths. Barely a decade old, the mountain bike is being kicked off the mountain.

"Now I'm a raging activist!"

A few months after Linda Enis' unpleasant encounter, the Golden Gate National Recreation Area declared most of its narrow trails and some fire roads off-limits to bikes. A nurse who often commutes off-road by bicycle to her job at Marin General Hospital, Enis was so outraged that she signed on with mountain bike advocates working to keep their young sport from being legislated out of existence. "I am nonconfrontational by nature," she says, "but this issue has turned me into a raging activist!" She is now on the board of directors of the Bike Trails Council of Marin, one of 200 clubs affiliated with the International Mountain Bicycling Association, an advocacy organization dedicated to making peace on dirt. IMBA believes a small number of reckless cyclists have given their sport a bad name. IMBA wants to change the attitude of both the young gonzo rider bombing downhill on knobby tires, and the mature outdoorsman bristling at the thought of tire tracks where Vibram soles alone did tread.

Rolling Dinosaur Archives

In 1970s, Charlie Kelly (above) bounced over trails on a homemade forebear of mountain bikes; now his daughter, Dana, is a passenger.

The irony in these latter-day range wars is that the site of the bloodiest clashes is also the birthplace of the vehicle that has caused all the trouble. If the "mountain" in "mountain bike" refers to any place in particular, it would be Mount Tamalpais, or "Mount Tam," the 2,600-foot peak that presides over Marin County's sculpted landscape of majestic bluffs and undulating hills. In the mid-'70s, Mount Tam's dirt roads and trails beckoned to a local contingent of self-described "bike bums." Once they saw how much fun it was to leave pavement and traffic behind, they began tinkering in their garages until they had reinvented the bicycle.

"I wanted a bike I could ride off the road, both uphill and down, and it had to be strong so I didn't come back home with the parts in my hand," recalls Gary Fisher who, with his roommate Charlie Kelly, began renovating old Schwinns they scrounged out of junk heaps and the back rooms of bike shops. The low-pressure balloon tires devised by Ignaz Schwinn in the 1930s cushioned the blows of rough terrain, while the old-style flat handlebars allowed a comfortable riding position, and the high bottom brackets (the lowest part of the frame) gave needed clearance. "They weren't fast, but they were comfortable and classy," Fisher remembers. "In the mid-'70s we had a kind of cult riding everywhere on these clunkers." Now president of the Fisher Bicycle Corporation, a $20 million company that makes more than 60,000 bicycles a year, he looks up from a computer screen in his office and reminisces. "It was the golden age of the mountain bike."

Inevitably the idea of a race occurred to Kelly, and in September 1976 he and a few friends organized a competition down Pine Mountain, a few miles north of Mount Tam. The record book of times and finishers at that first race has long been lost, but the race earned a strange appellation that will not be forgotten in the annals of mountain bike lore: "Repack."

"We were still using coaster brakes–the kind you operate by pushing backwards on the pedal," explains Kelly, who now writes for mountain bike magazines in six countries. "After a 1,200-foot descent in 1.8 miles, our hubs overheated so much that the grease sizzled right out of them. Before we could ride again, we had to repack the bearings with grease. I don't know who said it first, but soon everyone called the hill 'Repack,' and from that the race took its name."

Resourceful and experimental, the Repackers cannibalized parts from practically every kind of two-wheeled vehicle they could find: gears and derailleurs from ten-speed bikes, thumb shifters from inexpensive five-speeds, hefty brake levers and handlebars from motorcycles, rear hubs from tandems, even drum brakes from industrial tricycles. Onto the resuscitated Schwinns went all of those parts and more, and if they didn't fit, the improvisers grabbed a hacksaw or a drill and made them fit. Joe Breeze, an accomplished bicycle-frame builder(see cover), shaved eight pounds off the leaden Schwinns when he built the first successful bike frame designed for off-road use, aptly named the "Breezer." Now riders could go clunking uphill as well as down.

One of author David Schwartz's most recent books for children, Supergrandpa, *honors an elderly cyclist who won Sweden's national bike race in 1951.*

Both: Tom Stillo

At the annual Fat Tire Bike Week held in Crested Butte, Colorado, "bicycle limbo" is now the most popular event.

Two mountain bike enthusiasts created hybrid sport of bicycle polo–much like the original, minus ponies.

Another builder, Charlie Cunningham, beat that with an even lighter aluminum frame. Then, when Japanese and American manufacturers introduced featherweight alloy rims, with light, knobby tires to match, the clunker crowd did wheelies with joy. The bikes dropped another six pounds.

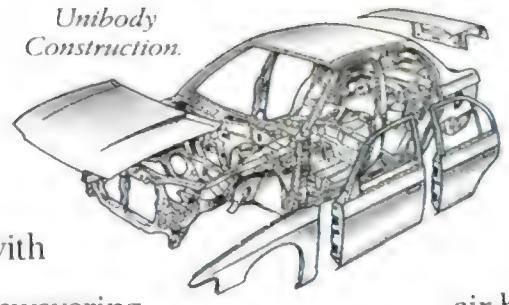
In time, Repack became too popular for its own good. Racers were already arriving in droves by 1984 when a television feature made matters worse. With hiker-biker tensions already on simmer, authorities closed down the race. But in July and August 1996, fans of Repack will get their due reward: 20 years after the first organized mountain bike race, the sport will make its Olympic debut in Atlanta. "For a sport to go from zero to warp speed so quickly is unprecedented," says Brian Stickel, director of competition for the National Off-Road Bicycle Association, which governs mountain bike racing in the United States.

Although Fisher, Kelly, Breeze et al. are generally credited with inventing the mountain bicycle in Marin County, similar innovations were being tried in Crested Butte, Colorado, where downtown streets were unpaved into the 1980s. Even in earlier eras, people had cobbled together bikes for off-road use–in fact, before the advent of pavement in the 1890s, all roads were "off-road." Historical photographs show bicycle excursions on Mount Tamalpais in the 1890s, and in the same decade miners in Alaska used bikes to cross 1,000 miles of hard-packed snow en route to the Nome goldfields.

"You can't say that mountain biking was invented at any one time or in any one place," asserts Charlie Kelly, who has chronicled the sport since 1980, when he co-founded the *Fat Tire Flyer*, mountain biking's first publication. "The only thing we had in Marin that no one else had was critical mass."

At a trade show, a star is born

It was a critical mass that led to an international chain reaction. Convinced that people would pay good money for clunkers, Fisher, Kelly and frame-builder Tom Ritchey went commercial. Naming their product "MountainBike" (they later lost the right to the moniker when the U.S. Patent and Trademark Office deemed the name overly descriptive), the threesome introduced their creation to the bicycling world in 1981 at a trade show in Long Beach, California. Industry moguls reacted predictably: they laughed. But the owner of a small company called Specialized Bicycle Components bought four of the ugly bikelings, made some modifications, had cheap frames manufactured in Japan and introduced the world's first mass-produced mountain bike in 1981. Called the Stumpjumper, 500 of them sold out in 20 days. (One now resides in the Smithsonian's National Museum of American History.) The big boys



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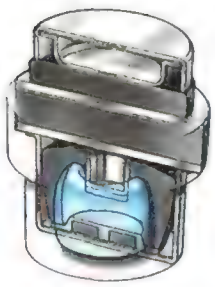

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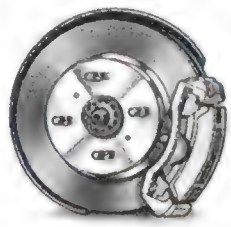

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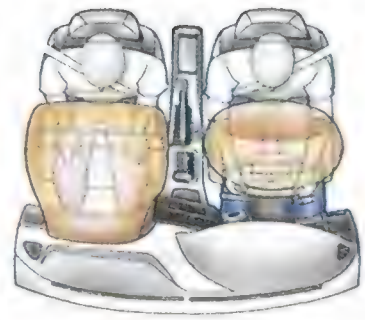

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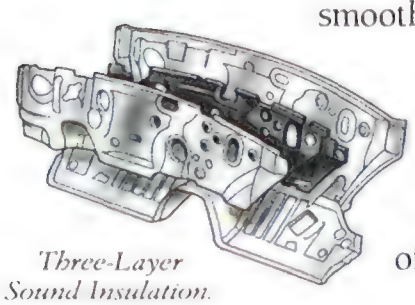

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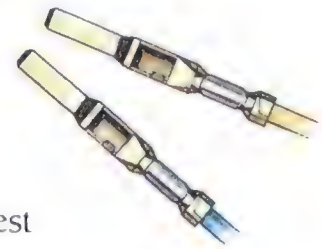

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Ed Diehl

It's not all mud and muscles, says Women's Mountain Bike & Tea Society founder Jacquie Phelan (left).

Nathan Bilow

At Crested Butte in 1991, then professional mountain biker Nancy Walker-Aubry whizzes down a racecourse.

of the bike business got the message, and the next year they came out with all-terrain bikes of their own. By the end of 1983, there were 200,000 of them on and off the roads of America.

Thirteen years and 30 million mountain bikes later, the wonder bike has transformed an industry. Of 8.7 million adult bicycles sold in the United States in 1993, almost 8.4 million had flat handlebars and fat tires–direct descendants of the Marin County clunkers. The svelte, drop-handlebar racing bike, rolled out before the American public 30 years ago as *the* bicycle for adults, is becoming an endangered species.

The ultimate user-friendly bike

The racing bikes of the '60s and '70s, with hard seats and harder tires, required well-toned riders with perfect balance, a penchant for calluses and the ability to fix flats. To everyone else, ten-speed racers were about as user friendly as computers of the same vintage, and many of them took an early retirement in the garage. "But the mountain bike," says Bill Wilkinson, executive director of the Bicycle Federation of America, "puts a big smile on your face the first time you hop on. The mountain bike is the Macintosh of transportation."

Borrowing from aerospace technology, the latest mountain bikes are built of titanium, aluminum, carbon composite, resin-impregnated cloths and other up-to-the-millisecond materials. A composite frame can weigh less than the two quarts of water a rider might pack on a sultry day. True to the origins of the sport, small-timers continue to tinker, inventing components and accessories both practical and frivolous–an easy-in, easy-out toe clip, a spring-loaded gizmo that allows you to adjust your seat's height while you ride, earmuffs that attach to a bicycle helmet. Working with the inventors of aluminum baseball bats, a small firm in Southern California called Answer Products redesigned the handlebars to be stronger, lighter and more shock absorbent. A cyclist named Paul Turner miniaturized hydraulic shock absorbers, called his product Rock Shox and started a rage for bicycle suspension systems.

To economists who care more about where products are made than how, mountain bikes provide a bright spot on a cloudy balance-of-trade ledger. "In an industry that competes in innovations, the trick is to put your product on the market as quickly as possible," says Dick Resch, a vice president at Cannondale, a major manufacturer of all-terrain bicycles. "The best way to do that is to have complete control of the process and keep it close to home." All of his company's bicycle frames are produced in Bedford, Pennsylvania; the Trek Bicycle Corporation, a chief competitor, makes most of its bikes in Waterloo, Wisconsin. No matter where a mountain bike is made, chances are it was designed in the USA.

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The bicycle of the future may do away with the diamond-shaped frame that has formed the skeleton of bicycles since the 19th century. A radical creation by Alex and Skooks Pong, a father-and-son team from Whidbey Island, Washington, is about to be produced by Cannondale(p. 86). The bike, looking almost extraterrestrial, is built around a flat, hollow frame of aluminum plates bolted together in an oblique cross and attached to each wheel with articulated struts that pivot like human knees. In place of spokes, each wheel has five wide flanges in a starfish assembly bolted to the rims and central hub. Alex Pong doesn't even refer to his bicycle's central component as a frame. "I call it a fuselage, not because I want you to think it's an airplane, but because I want to change 'bike think,' which has been stagnant for about a hundred years."

As mountain biking entered adolescence in the 1980s, enthusiasts sought new places, and new ways, to ride. Ski resorts saw the potential for off-season business, and many opened their trails to bicycles–chair lifts outfitted with bike racks are a boon to riders who prefer to do their rolling in a predominantly downhill direction. The more adventuresome traversed Africa and the Hindu Kush, or headed to Alaska in midwinter for the Iditabike, a 200-mile race along part of the course used by the Iditarod, Alaska's famous dogsled race. Outside Moab, Utah, mountain bikers discovered the Slickrock Trail, a 13-mile loop on a field of sandstone dunes. It offers roller-coaster thrills for those with technical skill and saddlebags of nerve. Despite its name, the sandstone surface has so much friction that riders can attempt unthinkably steep inclines. With 100,000 visitors a year, Slickrock and other mountain bike routes in the red-rock canyon country have transformed sleepy Moab into southeast Utah's major tourist center.

The area around Crested Butte, Colorado, gained notoriety among mountain bikers in 1976 when a party of 15 locals decided to ride en masse to Aspen via 12,700-foot Pearl Pass, a boulder-strewn mule trail. Only two of the hardiest (or foolhardiest) actually finished the trek, but that didn't discourage most of the others from trying again two years later, joined by Marin County's Charlie Kelly and some friends. The ride became an annual event, and organizers added tamer tours for those who preferred less gnarly terrain. Now, for a week every July, the alpine passes and wildflower-specked meadows above Crested Butte are the backdrop for Fat Tire Bike Week, a family event that includes a mountain bike rodeo–complete with barrel race, log pull and "bicycle limbo" (an event that rewards the shortest participants).

In 1987 Trice Hufnagel, playing croquet with friends in Crested Butte, impulsively hopped on her bicycle, charged the ball and whacked it down the field. "Look!" she cried. "Bike polo!" A sport was born. Hufnagel and her husband, Lou Gonzalez, adapted the rules and equipment of polo to the mountain bike, which they see as a proletarian sort of polo pony. The high point of the year is their annual Polo to the People Tour–they hold polo clinics and tournaments around the United States. There are now about 65 amateur leagues across the country and the annual Official Bicycle Polo World Championships in Moab on Halloween weekend.

In Oakland, California, at Chabot Regional Park, volunteers Jim Tolley (left), Michael Kelley of the Bicycle Trails Council of East Bay, carry their "take it easy" message to a pair of fellow bike riders.

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EXOTIC Thailand

In police departments across the nation, introduction of mountain bikes has meant a bold new weapon for apprehending criminals. In Seattle, officers James Stephens (left), Phil Wall, patrol Pike Place Market.

Mountain biking has never been strictly a boys' club: three of the original Repack riders were women. One of them, Jacquie Phelan, now a professional mountain bike racer, founded the Women's Mountain Bike & Tea Society for "women who love mud too much, and those who would like to love it more." With more than a thousand members in nine chapters around the country, WOMBATS emphasizes the health and self-sufficiency side of mountain biking, rather than the thrills and spills.

Most mountain bikes never dig their tire treads into dirt–only a small percentage of riders regularly venture off-pavement–but the sturdy machines have proved their mettle on the heaves and holes of mean city streets. A bike with so many advantages would be perfect for police, reasoned two Seattle policemen in 1987, and their bosses agreed. Seattle's two-man bike patrol has grown to 70 full-time officers, the nation's flagship mountain bike squad. Hundreds of other police departments–even Scotland Yard–have contacted the Seattle Police Department for advice in setting up bike squads.

"It's a superb law enforcement tool," says Sgt. Jack Hanson, former supervisor of the force's West Precinct Bicycle Patrol. "We have the edge on everyone. We're quiet, we're quick, we can go down alleys, we can jump curbs, we can ride down stairs and cruise along the waterfront. We can even get our bikes in the elevator at Pike Place Market! We come out of nowhere, slide the rear wheel around to block the guy from behind, and grab him by the wrist before he can reach for his weapon. His jaw drops, and all he can say is, 'Where did you come from?' The bike is our secret weapon!" In Seattle, bicycle patrol officers make almost seven times as many arrests as foot patrolmen.

With so many users and uses, there's little question that mountain bikes are on a roll, but just where they will be allowed to roll remains an open question. In many areas, cyclists have regained lost ground as icy relations between outdoor user groups have thawed.

After reconsidering the issue, land managers around the country have reopened thousands of miles of trails to bikes, but Tim Blumenthal of the IMBA thinks it's too soon to celebrate. Those trails represent only a small percentage of the trail-closure total. Although IMBA wants to raise the percentage, the organization agrees with those who want to keep bicycles out of many areas designated as wilderness. Elsewhere, where foot traffic

DOROTHY HAMILL

Gardener, Olympic Gold Medalist

I remember helping my mother in her garden when I was little. I was so proud.

Now, when my daughter, Alexandra, helps me in our garden,

I get that same wonderful feeling, like remembering a dream.

My mother let me feed her plants with Miracle-Gro, a cupful at a time.

Today, I wouldn't use anything else. Like mother used to say,

"There's nothing like Miracle-Gro."

Dorothy Hamill

MIRACLE-GRO

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is very high, the organization suggests that some narrow paths be declared bike-free.

Buoyed by studies showing that bicycle tires cause no more erosion or trail damage than the boots of hikers–and far less than horses' hooves–mountain bike advocates are starting to find receptive ears among environmental organizations. The Wilderness Society, for example, has articulated a bike-tolerant position. Even the Sierra Club, one of the first groups to denounce mountain bikes, has softened its attitude. The club now supports the opening of public lands to bicycles where studies show that there would be no significant damage to the land or interference with other users.

In April, representatives of the Sierra Club and the IMBA met for mediated discussions of the issue. "I know," says George Barnes, a member of the Sierra Club's delegation, "17 different ways to manage land for bicycle use other than totally open or totally closed. By talking together, we can try to identify alternatives that could open more trails to bikes and leave environmentalists and other trail users happy, too."

In pursuit of happy trails, bicycling organizations around the country are bending backward over their chainstays to dispel the hell-on-wheels view of them. Just north of Los Angeles, mountain biking thrives in the Santa Monica Mountains National Recreation Area, where last year members of the Concerned Off-Road Bicyclists Association logged more than 11,000 hours in mounted bicycle safety patrols. Equipped with radios and trained in first aid, CORBA volunteers work closely with the National Park Service and the California Parks and Recreation Department. They constantly remind other bikers that trail etiquette is in their own best interest. At the north end of Philadelphia's Fairmount Park, a 1,700-acre sylvan refuge called the Wissahickon remains open to bicyclists, largely because of the goodwill that results when 40 to 50 members of a local cycling group invest sweat equity in maintaining park trails one Sunday each month.

Across San Francisco Bay, the Bicycle Trails Council of the East Bay has followed CORBA's lead and organized a bicycle patrol to assist park rangers with public safety and education. On a warm August evening, I join Michael Kelley and Jim Tolley as they make their rounds of Anthony Chabot Regional Park, a 5,000-acre preserve of grasslands and eucalyptus groves in Oakland. The trails teem with users of all ages. It is clearly not a place for hotdogging on two wheels.

"Easin' by, on your left," Kelley softly warns a trio of joggers as he overtakes them. They nod and raise arms in acknowledgment. Approaching two horseback riders, he slows and gently chimes his bell, painted with the slogan "Peace On Dirt." The horses seem just a bit edgy. "It's OK," Kelley assures them in a voice that would soothe a bucking bronco; "my bike is afraid of horses." Everyone laughs. He's clearly winning PR points–no wonder park authorities say the bike patrol has reduced complaints by more than 50 percent.

We have just turned into the Towhee Trail when a biker, spotting Kelley and Tolley's bright green bibs marked "Bike Trail Patrol," stops to ask about joining. "There are still some people going too fast," he says, "and they're ruining it for everyone." Kelley, a lawyer from Berkeley, hands him a couple of business cards printed with the Bicycle Trails Council's address on one side and the "Responsible Off-Road Cyclist's Code" on the other. "Take two," he quips, "and call me in the morning."

Later, more cards and an avuncular lecture go to two Lycra-clad cyclists who come smoking down the trail. "John Muir said the parks belong to the people who use them," Kelley tells the speeders. "We're very big users so we must be responsible owners. Please remember that every rider is an emissary for the sport." The transgressors seem more interested in riding than in philosophizing, but they take the cards and depart on friendly terms. Of the 50 or 60 mountain bikers we encounter, they are the only ones in need of attitude adjustment.

"There are basically two kinds of riders," explains Jim Tolley as we climb toward a sweeping view of Lake Chabot. "We call them 'hammerheads' and 'flower sniffers.' The truth is, most of us are flower sniffers. Those fellows may be hammerheads now, but after they've heard our message enough times, they'll convert."

Greeting Arctic spring, Anchorage-based mountain bike club pedals a 20-mile circuit in sight of Knik Glacier.

Richard Larson

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By Richard Wolkomir

When the work you do ends up costing you an arm and a leg

If you're plagued by RSI (repetitive strain injury), a visit to New York's Miller Institute may save your hand, your hip–or your career

Dr. Emil Pascarelli's examination room, near Lincoln Center in Manhattan, is equipped with a piano and a snare drum. Also a harp. "It's a terrible harp," Dr. Pascarelli told me, shrugging. "Maybe somebody will give us a grant, and we'll get a better harp."

He is tall, his black mustache flecked with gray, and he has the melancholy eyes of a basset hound. But who wouldn't look sad? He has watched hundreds of performers wince in pain in this room, struggling to play that terrible harp of his, or the piano or snare drum. Hundreds more bring their own instruments–violas, cellos, French horns, electric guitars–everything from alto saxes to xylophones. Dancers bring their aching ankles. Singers bring their hurt voices.

I, too, brought my own instrument. It was a 386SX laptop computer, with a 60-megabyte hard drive. It had become my instrument of torture.

"Set up your computer on this table, just the way you usually use it, and I'll turn on the camera," Pascarelli told me, fiddling with a studio-quality video camera. A monitor behind him lit up, and I watched my hands on the screen, flitting over my laptop's keyboard. I momentarily forgot that my right arm felt–as usual–as if it had been dipped in molten aluminum. I watched admiringly as my fingers tapped out, "How now brown cow."

"OK, so what you've got is hyperextension of the little finger on your right hand, and that keyboard is putting both your hands into ulnar deviation, especially the right one, and there's some wrist drop, too," Pascarelli said as he squinted through the camera's eyepiece. "And you have to crane your neck to look down at the computer's screen, so your back and neck muscles are holding up the equivalent of a bowling ball."

Now I knew. My right arm feels struck by lightning because I am one more victim of a modern pandemic, machine-bites-man syndrome: I have "repetitive strain injury," or RSI. My muscles, tendons and ligaments failed to adapt to a machine not adapted to me.

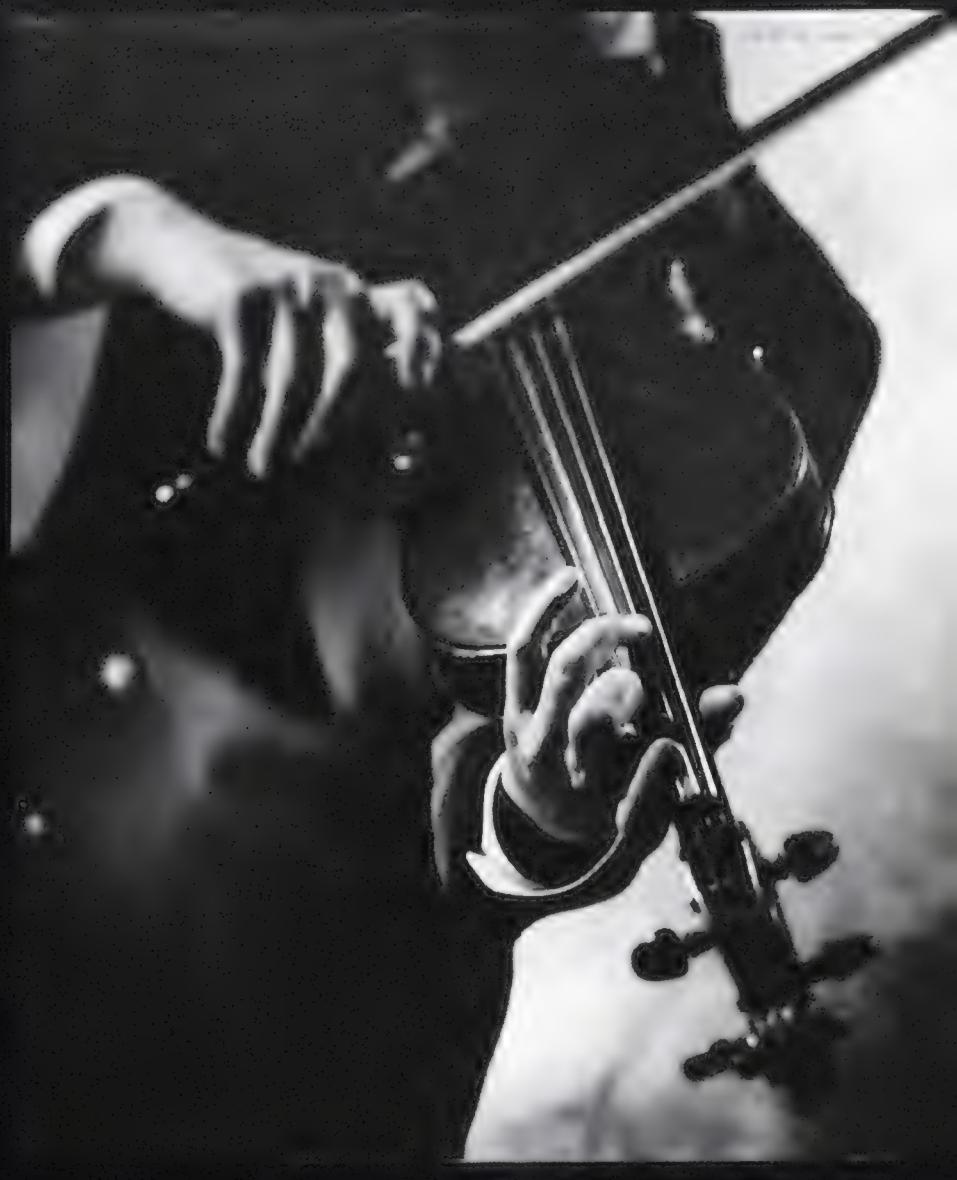
RSI is not new. In 1713 Bernardino Ramazzini, the father of occupational medicine, described pain in the hands of scribes. In 1897 an aching hand forced Henry James to give up his pen and dictate to his secretaries. With industrialization, which demanded ceaseless iterations of precise arm and hand motions, strain injuries proliferated. Mostly, the crippled workers suffered silently. But in the 1970s, when upscale sportsoholics began visiting doctors' offices, more attention was paid. "Tennis elbow" and "golfer's elbow" entered the medical lexicon. Now, with about 70 million personal computers sitting on U.S. desks, strain injuries are rampant. U.S. Department of Labor figures show RSI now accounts for 60 percent of all job-related illnesses. Estimates of the annual cost to business reach $20 billion.

I took my achy arm to Emil Pascarelli, yet I felt out of place. After all, he is the founder and director of the Kathryn and Gilbert Miller Health Care Institute for Performing Artists, the country's largest clinic for patients such as musicians and dancers. But my RSI did not come from a piano. It came from using–or misusing–a computer. "Writers and journalists are also keyboard performers," the doctor assured me. (Technically, strain injuries that afflict performing artists are referred to as "overuse syndrome," but the condition–and its treatment–are virtually indistinguishable from RSI.)

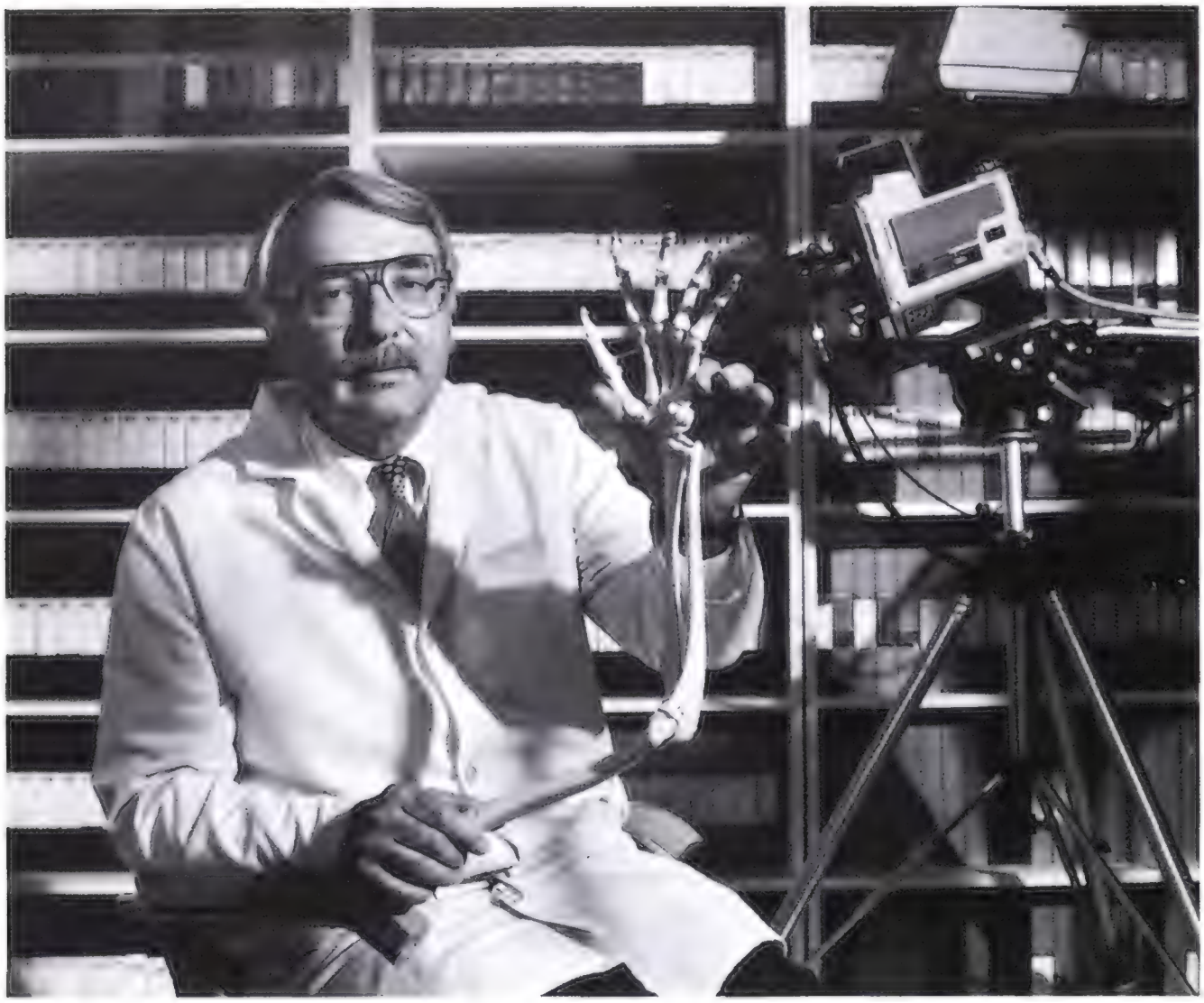
In fact, with computer use projected to reach 75 percent of all workers by the year 2000, Pascarelli and a former patient, health writer Deborah Quilter, have just brought out *Repetitive Strain Injury, A Computer User's Guide* (published by John Wiley & Sons). It applies to computer workers what Pascarelli has learned treating injured performers.

Musicians have long been hurt by their instruments. Ailing fingers forced Robert Schumann to forsake the piano for composing. Now reporters, writers, editors, secretaries and data-entry clerks outnumber musicians in the Miller Institute's waiting room. But whether we finger an IBM or a Steinway, our injuries are similar. We are all what Emil Pascarelli calls "sit-down athletes."

Whether you're a writer laboring at a computer keyboard (perhaps even an ergonomically advanced one like this), or a violist or dancer or pianist practicing hour upon hour, you could find yourself facing the RSI syndrome.



Photographs by Brad Trent



Seated beside his own most important diagnostic tool, the trusty video camera, institute founder Emil Pascarelli explains bone structure of our vulnerable-to-injury arms, wrists, hands.

Just twisting our wrists in order to make our palms face the floor (pronation)–so we can splay our fingers over a keyboard–strains muscles, tendons and ligaments. We add more stress with technique flaws, such as straightening our normally curled fingers as we pound a keyboard. Often we pound too hard. Our tissues tear.

To show me my own keyboard sins, Pascarelli froze my hands on his TV monitor. There was my right pinkie shooting out on its own (hyperextending) to reach distant keys. And my hands angled out like windshield wipers toward the ulnar bones on the outside of my wrists (ulnar deviation). I dropped my wrists too low as I typed, too, further straining the tendons. And peering downward at the screen strained my back. "Luckily, we've caught you early," Pascarelli said as he went to turn off the camera.

Lucky indeed. Left to our own devices, people like me–whom physical therapists call "motor morons"–often wind up crippled. If we keep making bad keyboard moves we can lose the ability to brush our own hair, open a door or use a knife to cut our own pork chops. We are out of luck. We may also be out of work.

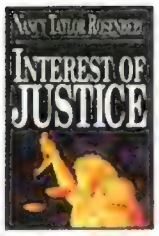
It was to help injury-stricken musicians that Pascarelli created the Miller Institute in 1985. He was the right man in the right place. After graduating from Columbia University in 1953 with a degree in fine arts, he traveled to Italy to work on a master's degree in art. But it came to him one day, in a kind of economic epiphany, that his chances of making a living as a painter were virtually nil. He decided he might as well be a physician, like his father, and so he enrolled in the medical school at the University of Pavia, in northern Italy.

These days he expresses his artistic bent by restoring his Greenwich Village home, an 1838 Greek Revival townhouse with lofty ceilings and carved plaster moldings. But the onetime would-be painter naturally empathizes with his performer and journalist patients. His wife is a former NBC news executive; his daughter works in the film industry; his son is the producer, on a shoestring, of a new chiller movie, *NightSwarm*, about giant mutant mosquitoes. And on his mantel is a photograph of actor Dom DeLuise, his cousin.

Still, Pascarelli's early jobs in medicine were far removed from the arts. Mainly, he started projects at Manhattan hospitals–a substance-abuse program, medical services for homeless people. In the early 1980s he was New York City's medical director of emergency medical services. Today he is on the faculty at Columbia University. He also is director of ambulatory care at St. Luke's-Roosevelt Hospital Center. "This hospital is right in the middle of it–Lincoln Center, Carnegie Hall, City Center, ABC, NBC, CBS, the Juilliard School, Broadway–and we were seeing a lot of musicians," he says.

At the hospital, Pascarelli decided to create a clinic

One of frequent contributor Richard Wolkomir's recent articles, on American Sign Language, won an award from the Easter Seal Society.



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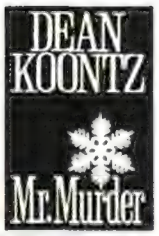

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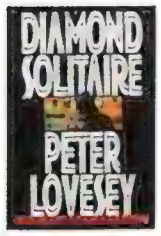

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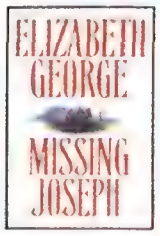

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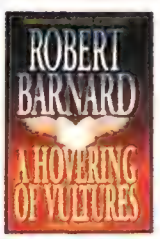

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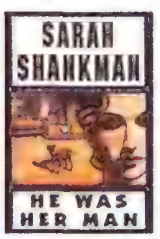

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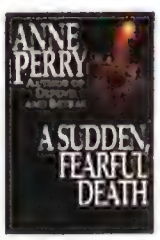

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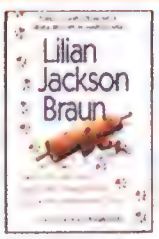

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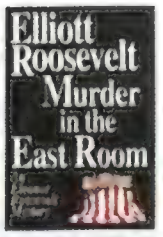

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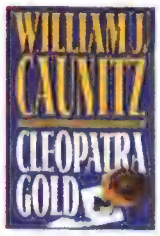

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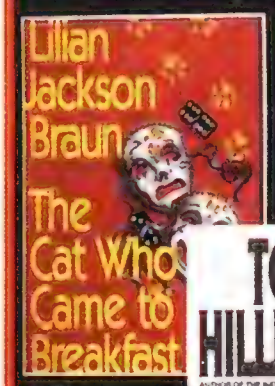

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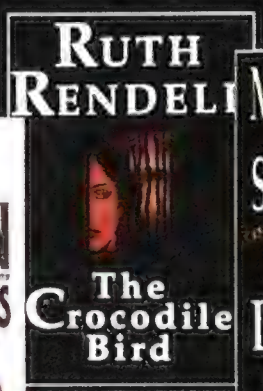

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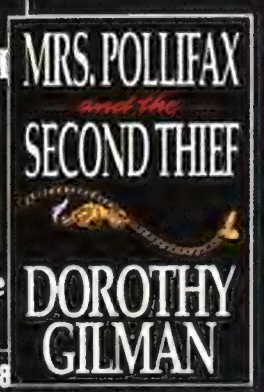

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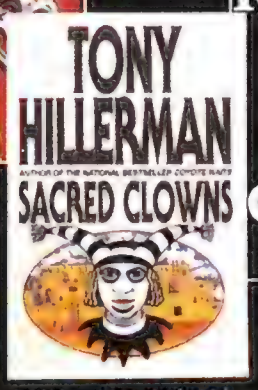

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Speech pathologist Lynda Marvin (left) examines singer Sue-Anne Morrow, being treated for vocal cord strain.

Retraining specialist John Kella, also a musician, helps violist Cecilia Caceres adjust bowing technique.

for performers, staffed by specialists like dermatologists, since violinists frequently abrade their chins. But most musicians' ailments are forms of RSI, and so the clinic would offer such services as orthopedic surgery, occupational medicine, physical therapy and speech pathology. The Miller Health Care Institute for Performing Artists opened in 1985 with funding from philanthropies. "Musicians are the working poor," Pascarelli says. Many cannot afford health insurance, and so the Miller Institute operates in the red.

It is by far the largest of the country's more than 20 clinics for performers. About a thousand patients a month come through the doors–ballet dancers, Broadway dancers, philharmonic flutists and rock'n'roll guitarists, U.S. Army buglers, opera singers, bluegrass banjo pluckers and concert pianists. They come from as far off as China. "We believe we have the world's largest collection of injured musicians performing on videotape," Pascarelli told me as we sat in his examining room, where he videotapes performers and typists to spot their technique flaws. "Of course, these video archives," he adds, "are confidential medical records."

He slid one of his tapes into a VCR. On the monitor a 20-year-old woman from Puerto Rico (one patient who agreed to let her tape be used for teaching purposes) struggled to play the examining room's piano. "She has forearm RSI, and she's in pain," Pascarelli said, studying the woman's hands pounding the keys. "She's a real banger," he said. "Also, you can see she's dropped her wrist and has her thumb curled under–we had to teach her to keep her hands and arms in the proper position, so she could use the muscles in her shoulders instead of just her wrists and fingers."

Fast-forwarding a pianist in pain

The tape fast-forwarded through months of therapy. I watched the pianist work on the "choreography" of her finger and hand movements with John Jake Kella, a violist who performs with the Metropolitan Opera. Kella studied biomechanics at MIT and titled his New York University doctoral dissertation "The Psychology and Physiology of Skilled Performance in The Arts." He helps Miller Institute patients fix their playing techniques. The tape cut to a concert stage in San Juan. Wearing a white dress, the pianist sat poised over a piano's keys, her debut. She began to play. Her fingers floated effortlessly. "Remember what she looked like initially," Pascarelli told me as the piece ended and the audience burst into applause. He looked as close as he can get to gleeful.

Next on the TV screen, a young man played a flute. The music was haunting, but abruptly it turned ugly. The flutist's upper lip had jutted out, losing contact with the mouthpiece. "When I take a breath, my lip just

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Occupational therapist Ellen Kolber introduces writer Anne Marie Gefell (left) to finger-friendly keyboard.

sticks out like that," the man said, obviously near tears.

"Focal dystonia of the upper lip," Pascarelli told me, studying the image on the screen with great melancholy. Dystonia is an overuse ailment in which messages between the brain and a performer's finger–or lip–mysteriously go awry. Such injuries can end careers or change them. Pianist Leon Fleisher, who has lost the use of his right hand, recently issued a recording with a revealing title: "Piano Works for The Left Hand."

Once, Pascarelli cured a champion banjo player's crippling RSI by simply moving the strap that held the banjo from his right shoulder to his left. Usually, however, it is not so easy.

I talked with one of Pascarelli's former patients, jazz pianist Bill Gordon. "I got up one morning in 1979, sat down to play, and one finger on my left hand no longer responded," he told me. "I could no longer do a descending scale, and I wrote a lot of pieces to avoid that altogether." Gordon did not know it then, but he had focal dystonia. Unfortunately, physicians did not know what it was, either. "I ran into a lot of callous and arrogant doctors," he said.

Gordon moved to Raleigh, North Carolina, where his condition eventually worsened. In 1988 he desperately telephoned the Miller Institute. Pascarelli told him to stop playing the piano for a week, and then to play no longer than three minutes at a time. And to get therapy. As a Miller Institute patient, Gordon gradually extended his playing sessions to 45 minutes. Meanwhile, Pascarelli and Jake Kella taught him, among other techniques, to move his entire hand to reach the keys, rather than just poking out with his fingers. "Now I don't have the problem," says Gordon, who has taken to calling his performances "Look Ma, Two Hands!"

An instrument's hidden perils

Every instrument is risky. Drummers have come to the Miller Institute with "trigger finger," a curled-up index finger. And every wind instrument has its own "embouchure," which is the relationship between teeth, tongue, pharynx and other parts of the mouth, in addition to the lungs and respiratory tract. All must work together to produce the proper sound. "We recommend that all wind instrument players have plaster casts made of their teeth, so that if they lose them–the way trumpet player Chet Baker did–they won't have to relearn how to play the instrument," Pascarelli told me.

Oboists sometimes build up so much air pressure on their mouth's capillaries that they paralyze their soft palate. Wind instrumentalists also succumb to lip dystonia, which usually is incurable. "But dystonia is task specific, so they can switch to another instrument, and some are so similar, like the oboe and clarinet, that the switch isn't so hard," Pascarelli said. His prescription

While it looks for all the world as if he's attached to an instrument of torture, dancer Ariel Ramirez is in fact being treated by therapist Katy Keller for chronic hip tendonitis–a condition common among dancers.

often includes altering injured performers' one-size-fits-all instruments to match their proportions. "Sometimes they cry when we tell them they have to put extensions on the keys of their beautiful flutes," he says, with a resigned shrug.

"Music schools are failing us," says Pascarelli, "because they don't stress physical conditioning. Most musicians fail to grasp that they are athletes, and that instead of practicing six hours a day they would be better off spending one of those hours running or lifting weights."

Instrument design is also a problem. "We're trying to adapt bodies to instruments, rather than vice versa," Pascarelli told me. "The violin is an ergonomic disaster," he added. "If only it could be played on a table, held in place by pegs or snaps." He lifted an imaginary violin to his shoulder and began to play, showing how the instrument tends to rock, forcing the player to hold it in place with the pressure of his thumb. And if that thumb is weak . . .

One afternoon I sat in on a violin therapy session. Jake Kella was helping Tim Fine, a 41-year-old real estate executive who has been a passionate amateur violinist since he was 16. "I woke up one morning and I could not move the index finger on my left hand," Fine told me. "I saw two surgeons, tried anti-inflammatories with no effect. Then a therapist put a splint on my hand, which spread the problem to the next finger. And then a Juilliard teacher sent me to Dr. Kella."

Fine's paralysis, Kella now explained, came from the angle of his finger and his elbow position as he played the violin. The result was tenosynovitis, inflammation of the sheath around the tendon between his index finger and his thumb, a form of RSI.

Now Fine's regimen includes warm-up arm swings and hand massages. "Surgeons had said it would get worse," he told me. "It's getting *better!* I'm really delighted at what's happening." He said the retraining has helped more than just his finger paralysis. "It's actually improving the tone, at least according to my wife."

Voices, too, are musical instruments. Miller Institute speech and language pathologist Lynda Marvin told me, "Singers' nodules are probably among the oldest

As Pascarelli tapes session, retraining specialist Vera Wills helps James Gabriel learn new keyboard technique.

known forms of RSI injury among performers." Vocal cords (now called "vocal folds") are liplike structures. "They're muscles like any others," Marvin said. Air from the lungs vibrates the cords, producing sounds. But "banging the vocal cords together," as the tissues vibrate, can cause calluslike nodules. "We get singers and actors, sometimes teachers; we had an airline flight attendant who has to talk over noise."

Like many Miller Institute staffers, she is familiar with her patients' problems. The daughter of Tony Marvin, the mellow-voiced announcer of the 1950s Arthur Godfrey radio show, she is a former professional singer. "Smooth and flowing is a watchword in voice therapy," she explained. "If you use too much energy in the wrong place, you get strain–writers who have to switch to voice-activated computers often develop voice problems."

Orthopedic surgeon Phillip Bauman treats dancers at the Miller Institute. "It is extremely unusual to be a professional dancer of any type and not have injuries," he said. Typical, according to Dr. Bauman, is a chronically inflamed tendon that runs behind the ankle and controls the big toe. "It's much more common in ballet among women than men because of the point work." Broadway dancers, he said, often develop inflamed hip tendons. "They'll do the same show with the same movements for two hours, eight times a week, plus rehearsals. And some of these dancers remain with the show for two years."

Strain injuries are only now becoming understood. Dr. George Piligian, an occupational medicine specialist at the Miller Institute, told me strain can cause microscopic tears in tendons, ligaments or muscles. "Tennis players can get similar injuries, and that's well described. But somehow, with performers, computer operators and blue-collar workers it hasn't received that kind of scientific scrutiny–sometimes because disability and workers' compensation payments are involved."

Researchers do not yet know all the reasons why the torn tissues are so slow to heal. Piligian suspects that tensed muscles in the affected zone constantly contract, squeezing capillaries. As a result, the injured tissues receive too little blood. Not enough oxygen and nutrients get in, not enough wastes get out. Pascarelli has suggested another reason that strain injuries may worsen over time: scar tissue slowly replaces muscle. The scar tissue can impede surrounding muscles, leading to more microtears and more scar tissue. Eventually, scar tissue dominates. The sufferer is crippled.

I spoke with a Miller Institute patient to whom that has happened. Grant McCool, originally from Scotland, was a copyeditor for Reuters in New York when he noticed a burning sensation in his arms. Typical of RSI victims, McCool worked hard, putting in long hours at his computer keyboard. And his fingers hit the keys hard. Pain began shooting up his forearms. "Sometimes when I woke up in the morning my arms were numb," he told me. That alarmed him. It alarmed me, too, hearing about the onset of his ailment–my arm also burned. Would McCool's fate be my own?

He can't even carry groceries

In March 1990, a physician told McCool to stop typing immediately. But it was too late. "I haven't done a day's typing since," he said. He doesn't open heavy doors much, either. "To carry groceries very far would be terrible." By the time he found the Miller Institute, the scarring of the tissues inside his arm had gone so far that not even Emil Pascarelli could reverse it. "I have a permanent injury," McCool says. "Now it's a matter of managing the pain."

In one way he was lucky: his employer valued his services enough to equip him with a voice-activated computer. Now McCool *talks* to his computer. He is not the only suffering writer in the New York Reuters office–out of about 130 journalists, 60 have reported some degree of RSI. Newsrooms have become war zones. Jake Kella is working with writers at the *New York Times* and *Newsday*. "I see all the injuries from those newsrooms, and it's like patching up wounded gladiators."

At the Miller Institute one day, I met patient Nicki

The little house at the bottom of the sea.

Back in 1983, several unusual underwater housing developments were built off the Florida coast. They're part of a unique program launched in waters that were once virtually empty of life. But now families of fish live in coral-covered cylinders that used to be gas station storage tanks—sandblasted clean and lowered into the sea as environmentally approved artificial reefs. Algae formed, fish gathered, and a food chain began which thrives today. And that's been good for both the environment and the local fishing industry.

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Physical therapist Michele Semler evaluates dancer who came to clinic complaining of pain in foot and ankle.

Goldstein, an executive assistant at ABC. Her long hours at the computer led to RSI. And that led her to a succession of orthopedic surgeons. Some physicians accused her of shirking work, but her real problem was overwork. After Goldstein's own small TV syndication business foundered, outgunned by conglomerates, she was jubilant to find work at ABC in June 1990. In August 1991, her office was moved to a new building, where the furniture felt too high. "When I said my hands were becoming painful, nobody took me seriously because I still never missed a day's work–I was afraid of losing my job," she told me.

Finally she needed two hands to hold a glass of water. "I was only in my early 50s, and I feared I was headed for a nursing home." Then she heard about the Miller Institute. After Pascarelli gave her his usual 90-minute examination, he told her she had deQuervain's disease. It is a form of RSI in which a tendon at the base of the thumb can no longer slide easily through its lubricated sheath. The result is intense pain.

Squinting through his TV camera, Pascarelli pointed out that as Goldstein typed, at blinding speed, she hyperextended her thumb. In therapy, she learned to relax her thumb as she typed and to move her entire hand over the keyboard, rather than simply stretching out her fingers. She also learned therapeutic exercises.

"I have to tell you that after two and a half years I just played golf again," she said. "And I'm living proof that if you catch it early enough you can have healthy people."

But too many are like me. We do not believe it could happen to us.

In July 1989 my wife Joyce's elbows ached after she had spent a Saturday with a kitchen knife, prying out leaves stuck between the planks of our house's deck. The next week she put in long hours at her computer. After that, the elbow ache was permanent. Sports-medicine specialists told Joyce she had tennis elbow. None helped. Some offered advice that only worsened her condition; she weakened, able to do ever less.

Our work took us to Monterey, California, where I spent a month jotting in a notebook all day. Nights, in our hotel room, I typed on my new laptop computer. Joyce worried that the table I was using was too high. But I insisted I was reasonably strong. How could I get RSI? Then I typed for an entire Saturday. Ever since, my arm has felt broiled.

"Women tend to be more comfortable talking about it than men do," Diane Nichols, coordinator of psychological services, told me at the Miller Institute. "Men particularly don't want people at work to know." Nichols said RSI victims often become depressed. "Your hand is how you manipulate the world. You connect in the business world with a handshake; you express confidence with your voice tone and your handshake."

Partly, it is our own fault. We sin at the keyboard. For example, when Pascarelli examined Joyce he noted that she is a "leaner," resting her wrists on the desk as she types, straining muscles and tendons. "Loungers" loll in their chairs. "Clackers" bang keys too hard. Pascarelli estimates that even non-clacker typists generate more than a ton of pressure per day at their fingertips. Data-entry clerks typically hit the keys tens of thousands of times a day.

But bad design also hurts. Pascarelli says the flat computer keyboard is a disaster. It requires a palms-down typing position, which strains tendons. Also, you have to hit some of the most frequently used keys, like "A" and "Shift," with your pinkie, the weakest finger. To reach some keys you stretch your fingers too far, a strain. Worse, sometimes you must stretch out two fingers of one hand to hit two keys simultaneously.

At war with our own machines

In some workplaces, computers count the keystrokes to force typists to meet a preset pace. Such pressure, on a badly designed keyboard, is a prescription for RSI. We are at war with our own machines. To see what is done for casualties, I followed my wife through treatment.

First came the videotaping. Pascarelli immediately spotted one of Joyce's keyboard flaws: she typed with her little fingers uplifted, like a Victorian sipping tea. He wired her arms to an ergometer, which emits R2D2-like beeps: the more the muscles strain, the faster it beeps. "Wiggle your fingers," he said. Lots of beeps. "Now hold up your pinkies." The ergometer shrieked. Pascarelli pretended to play a flute, holding up his little

fingers, as many players do. "Your pinkie is wired up like a little thumb," he said. "When you do this, you get overflow on the nerves, then you get cocontraction, so the muscles work against each other–that leads to trouble."

He tested Joyce's arms and hands, making measurements, having her squeeze, press or pull various gadgets. He ruled out rotator cuff tendonitis (injuries to the muscles and tendons near the shoulder joint, often caused by a keyboard that is too high). Nor did she have the numb fingers of carpal tunnel syndrome, one of several "tunnel" problems caused by swollen tissues pressing against nerves where the nerves pass through tunnels in bones or ligaments. He also ruled out a Pandora's box of other RSI ailments.

Joyce turned out to have medial epicondylitis, or pain from tiny tears in tissues on the inside of her elbow, and muscle inflammation. The unremitting pain had forced her to give up so many activities that her muscles were weakened, hampering recovery. "It's very amenable to aggressive physical therapy," Pascarelli explained.

Later, the institute's occupational therapists introduced Joyce to an ergonomic computer keyboard and a mouse, both designed to reduce strain. And she learned to ease stress on her arms by using such devices as a telephone headset and specially designed kitchen knives. Physical therapists taught her exercises that she will have to perform for months–or years–to restore her muscles and get more blood to the injured tendons, as she begins the maddeningly slow process of healing.

I will join her. In fact, as I type this article, I keep an egg timer set for 15-minute intervals. When it rings, I get up from the keyboard and rest my injured arm. Repetitive strain injury teaches us about our body's true nature: an exquisite contraption.

"When I go to a concert now, I don't really listen to the performers," Emil Pascarelli once told me, with a shrug of melancholy. "Now I just watch their posture, and how their hands and fingers move."

At studios of the Alvin Ailey American Dance Center, orthopedic surgeon Phillip Bauman offers his expertise. Using dancers to demonstrate physiological principles, Bauman explains stresses incurred in performing.

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ALL THIS AND THE QUALITY OF A MERCURY

By Sue Hubbell

You can still get it at the 'dime store,' but not for a dime

Today it'll cost you dollars, not cents. Don't complain, though–in an era of marts and malls, you're lucky if you can find a good 5 & 10

In 1982, Ed Graczyk's play *Come Back to the 5 & Dime, Jimmy Dean, Jimmy Dean* opened on Broadway. The setting was a faded old dime store in a small Texas town. The title drew not only on fans' yearning for the fabled movie star, who died in 1955, but also on nostalgia for the mercantile establishments that once thrived on Main Streets in towns across the country. The downtown five-and-ten-cent store was already something of a commercial period piece by the mid-1970s; today it's only a slight exaggeration to call it an endangered species.

Last fall, the Woolworth Corporation announced that it would close 970 of its stores in the United States and Canada, including nearly half of its 825 remaining dime stores. The closings included what may be the most famous dime store in America, the one in Greensboro, North Carolina, where, in 1960, four black college students sat down at the then segregated counter and ordered lunch, thereby initiating a rash of sit-in protests throughout the South. (That same counter has recently been acquired by the Smithsonian's National Museum of American History.) The Woolworth stores had lost $36 million during the first half of fiscal 1993. "They just hung on too long to many of those Main Street locations just out of affection for the nameplate," comments one industry analyst.

Frank Winfield Woolworth, who opened his first store in 1879 in Utica, New York, prospered as downtown America prospered, but fewer and fewer Americans live and shop downtown today. Other merchandising ideas, mart and mall, have captured buyers. Yet even so, the

Proud staff shows off elaborately decorated display windows at a typical Woolworth's store in early 1900s.

F. W. Woolworth himself spot-checked his stores and often submitted detailed critiques to careless managers.

Photographs and hand coloring by Regis Lefebure

On opening day at a new Kresge's, immaculate lunch counter announced fresh fruit sundae for just a dime.

Woolworth closings were not the "end of the dime-store era," as newspaper writers have put it in a flurry of sentimental pieces about local shutdowns. The five-and-dime ceased to exist soon after Woolworth's death in 1919.

During the founder's lifetime, it was a point of honor to keep the top price in his stores at a dime. This despite the fact that his imitators had begun to exceed that limit while continuing to call themselves five-and-ten-cent stores. But after his death, Woolworth's prices began inching upward informally toward the 20-cent mark. In 1935, the board of directors agreed to discontinue even the 20-cent limit and let goods be priced as conditions demanded. That meeting took place in the Woolworth Building in New York under a portrait of the founder, "whose blue eyes, and white mustache," writes Woolworth biographer John Winkler, "might have seemed aquiver with resentment."

If any particular time could be singled out as the year of the genuine five-and-dime store, it would probably be 1913. That was when Woolworth, the farm boy who became a millionaire in the best Horatio Alger tradition, obtained the help of a sitting President, Woodrow Wilson, to press the button that would turn on 80,000 light bulbs in the spanking new Woolworth Tower. Witnessing the event were 800 prominent men who had gathered in the tower's banquet hall to help Woolworth celebrate. Rising to a height of 792 feet and one inch, the building was then the tallest in the world. Woolworth had put $13.5 million into its construction and was bursting with pride over the statement it made.

All of his life, Woolworth had loved music. He may have hoped that "The Woolworth Rag," composed by F. Henri Klickmann to commemorate the tower, would be remembered. But when I went looking for it recently in the Library of Congress' extensive sheet-music collection, it was nowhere listed. A helpful librarian recalled seeing it buried in a box of uncatalogued material. She pulled it out, saying proudly, "I must be the only person in the Library of Congress who knows about this."

When he died a few days shy of his 67th birthday, Woolworth owned 1,050 five-and-ten-cent stores. His estate, valued at $65 million, paid a tax of $1.05 million. To the man on the street, his fortune, built on nickels and dimes, must have seemed as large as that of Croesus. But today, low-priced variety goods have once again created a new merchant royalty. A few months before the Woolworth Corporation closed those 970 stores, *Fortune* magazine announced that the second-richest family in the world was that of Sam Walton, founder of Wal-Mart. With a net worth of $23.5 billion, the Walton clan ranked just behind the Sultan of Brunei. It should be noted that Walton, who died two years ago, has his own monument, albeit something much smaller than the Woolworth Tower. Walton's 5 & 10 in Bentonville, Arkansas, the first store to carry the owner's name, got started in 1950. It is now preserved as a commercial museum.

This article will appear in the author's newest book, Farflung Hubbell, *to be published by Random House. Her 'hopping John' story ran in December 1993.*

Although some items sold in the high-ceilinged store were advertised at 25 cents, most were only 5 or 10.

I was born the year the Woolworth directors freed the prices in their stores and so I never knew a genuine five-and-dime, yet that was what we called the establishments on Burdick Street in Kalamazoo, Michigan, where I grew up. I can't remember all of the other shops in that bustling downtown, but I can remember S. S. Kresge, F. W. Woolworth and W. T. Grant. The last named was too upscale for me. It had been conceived by its founder as a 25-cent store. My allowance was only 15 cents, and I hoarded it over the months to buy Christmas presents at Woolworth's and Kresge's.

I was never allowed to eat in the stores because my mother insisted that the grease for frying was reused, but I can remember yearning for the doughnuts so temptingly displayed in the Kresge's window. They were produced by a machine with a revolving band that dunked them into sizzling fat. They smelled wonderful.

When my grades at school were not what my mother thought they should be, I was threatened with the possibility of growing up to become "a dime-store clerk." Secretly I didn't think that was half bad and pictured myself standing behind one of the open bins of shiny attractive goods at Woolworth's wearing a rhinestone necklace in the daytime (something else forbidden me). In those days the radio still played a 1920s song by Billy Rose and Fred Fisher that only reinforced my private unacceptable notions. It was called "I Found A Million Dollar Baby (In A Five And Ten Cent Store)."

Frank Woolworth, when he was 21 years old, took a job in a dry-goods store in Watertown, New York, to escape the drudgery of the family farm nearby. He was tall, skinny and frail. He was a bit of an esthete, inclined toward flute music, and had an air of the theatrical. He proved to be a poor salesman but could concoct artful window displays, often using red, the signal color for stores to come, to catch the eye.

Have I got a bargain for you!

Woolworth was first exposed to the idea of a fixed-price store when an acquaintance left Watertown to open a 99-cent store in Michigan. His friend returned on a visit during the 1878 recession and suggested establishing a nickel sales counter at the dry-goods store as a way to perk up business. The store's owner, William H. Moore, reluctantly tried the experiment. He was skeptical because, even then, nickel goods were cheap–and before the days of mass production they were also shoddy. They typically had been added to a traveling peddler's pack to attract interest in his other wares, and a quality dry-goods store did not want to offer merchandise that harkened to the peddler's-pack image. But the nickel counter did draw customers.

Encouraged by his new wife, Jennie, and fired with the idea of a store in which everything would sell for a nickel, Woolworth opened the Great Five Cent Store in Utica. Business was good at first but then slumped. Woolworth was still confident in the basic soundness of a five-cent store; perhaps the location was wrong. Later the same year he opened a similar store in Lancaster, Pennsylvania, under the original sign. It was augmented with another: "Woolworth's 5-and-10 Cent Store." The young man had added a line of "quality" goods at double the sale price and had thus escaped the notion that he sold only shoddy trinkets. The new store was a success, but Woolworth's biggest problem was finding suppliers of goods he could sell for 5 and 10 cents. He realized that if he could place very large orders, he would be able to dictate suppliers' prices, and so he began opening additional stores.

By 1918, just five years after President Wilson pressed the button that lighted the Woolworth Tower, there were 1,000 Woolworth stores, and the chain was expanding to England. Frank Woolworth was a wealthy man. But he was also fat, gorging himself on rich foods, and was growing remote from his business. He was increasingly driven to extravagant personal and public display. His wife, after encouraging and supporting him, had drifted away into some private mental fog. His heirs

In his store in Maine (see page 110), Pete Drinkwater holds a portrait of the 5 & 10 pioneer S. S. Kresge.

were waiting in the wings to marry (rashly) and spend his fortune. He died with his estate in disorder; he had never updated his will and left everything to his wife who was, by that time, a mental incompetent.

If, in a literal sense, the five-and-ten-cent store died with him, it had nevertheless become a part of American life, and the name lingers on. "Spicer's 5 & 10" says the sign in red and gold on a white store in a sparkling new shopping center in Ladue, Missouri, an affluent suburb west of St. Louis. Ladue is adjacent to another wealthy suburb, Clayton. Max Spicer, who was for a time the manager of a successful Woolworth's, started his own store in Clayton in 1947. Later it was moved to another location in Ladue. After Spicer died in 1970, Jim McNulty, who had worked for him, became owner and president of the store. Over the years he has opened two branches in other suburbs and just last year moved his flagship store to the present location.

McNulty, a heavyset man in his 40s with an engaging manner, says proudly, "We're number one in the country for dollars spent per square foot in this kind of variety store. We average $500 annually in sales per square foot. About 150,000 people shop here every year. Our customers are well-to-do and short on time. Yes, we deliver. I started from humble beginnings and worked hard, but I always knew I was going to be rich." A smile spreads across his face. "And now I *am* rich."

His store, brightly lighted, carpeted, covers 6,000 square feet. Its 38 employees, some part-timers, unobtrusively assist customers who want help in selecting just the right party favors or just the right toy. Background music plays. There is an immaculate restroom available for the public, a convenient telephone. I browse past the tin soldiers and the toothbrush shaped like a dinosaur, play with a top, see thumbtacks, tape, typing paper, tote bags, a trapped-rat cat toy. I buy a tiny bottle of beeswax furniture polish and a red plush Father Christmas hat, supported in its own gilt cardboard crown, for my husband to wear on the occasion of his grandson's first Christmas. My purchases, packed into a plain brown bag, come to $13.73.

From cutting meat to cutting prices

Half a continent away, under another anachronistic sign, the Winter Harbor 5 & 10 is tucked into the small commercial section in the Maine village of the same name. It was opened first in 1972, in a 1923 building that previously housed a grocery and dry-goods store. Pete Drinkwater and his wife, Sandy, bought the store five years ago and live in the apartment above it. A man with a quick and friendly smile, Pete takes me on a tour, shows me the stuffed storage area that once was a butcher's cold room, points out the old meat hooks. I admire the store's creaking oak floors and the cream-colored, pressed-metal ceiling. We visit the basement, brimming on this November day with Christmas goods soon to be displayed. The Drinkwaters' 1,700-square-foot enterprise is jammed with merchandise: bird feeders, Ben Gay, bells, buoys (this is coastal Maine, after all), brooms, batteries, butcher knives, beaters, baby goods, brushes and baseball albums. Clothes, too.

I ask Drinkwater about the "5 & 10" part of his sign. He laughs. "Well, maybe it's more like five and ten *dollars* today." Drinkwater comes out of a Kresge background. After finishing business college in Bangor, he went to work for the K mart Corporation, into which the Kresge stores had been subsumed. After working in several K marts, he was transferred to Upper Darby, Pennsylvania, to manage a Kresge store. "That was one of the two last remaining S.S. Kresge outlets in the country," he says, "and after it closed I was able to take a portrait of S. S. Kresge himself. Let me show it to you." Drinkwater, a young man, dashes upstairs to his apartment and returns lugging a huge, heavily framed likeness of a balding, bushy-browed man in the best founder-of-the-business school of portraiture. "Look at his eyes," Drinkwater says. "They follow you no matter where you stand."

Sebastian Spering Kresge was one of the many men

"The first time I gave her a diamond ring her hug took my breath away."

I'll always remember that face.
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who imitated Woolworth and also gave their names to stores we still lump together and call five-and-dimes: G. C. Murphy, S. H. Kress, J. G. McCrory, J. J. Newberry. Like Woolworth, many of those men had some Pennsylvania connections. S. S. Kresge was no exception. Born in Bald Mount, Pennsylvania, in 1867 into a frugal Swiss-German family of farmers, the young Kresge also wanted to escape farming life. He struck a bargain with his father: if his father would help him complete his schooling, he would give over to him all the money he would earn until he was 21. With the one exception–an exception almost too touching for a fellow beekeeper to recount–that he could keep all that he could earn selling honey from his hives of bees. During this time, Kresge built up a small apiary of 32 hives and "led Monroe County in bee culture," according to his son and biographer, Stanley S. Kresge. His honey sales, together with the money he was able to save from odd jobs and selling tinware, made it possible for him to go into business for himself by the time he was 30 years old.

While working as a traveling salesman, Kresge had met Woolworth and been inspired by him. Rebuffed in his attempt to go into partnership with the man, Kresge instead joined forces with another Pennsylvanian, J. G. McCrorey, who was later to drop the *e* in his last name and in his own stores. In 1897 they opened a five-and-ten-cent store in Memphis, and shortly after that they opened another one in Detroit. Two years later, Kresge exchanged his interest in the Tennessee store for the one in Michigan and began, on his own, opening other stores to achieve the economies of scale that Woolworth had discovered were necessary. By the time he died in 1966, Kresge owned 930 stores.

In 1913, the year that Woolworth completed his tower, Kresge had more than a hundred stores and issued *Kresge's Katalog of 5¢ and 10¢ Merchandise.* Reprinted in 1975 by Random House, the "katalog" is a delight to browse: a nickel then could buy you a U.S. flag, an electric egg whip or two nursing bottles. For a dime you could have a lady's vest, a rosewood pipe or a child's straw hat.

S. S. Kresge kept his thrifty Swiss-German ways throughout his life, despite the fact that he accumulated enormous personal wealth. The stories about his parsimony are many. His *New York Times* obituary reports "a pinchpurse attitude . . . was part of the breakup of two of Mr. Kresge's marriages." He wore his shoes until they had holes, then lined them with paper and wore them some more. He once reprimanded his valet for pressing his suits, saying, "Don't you realize they will

Bikes and buoys are among the products on display outside Winter Harbor 5 & 10. Owner Drinkwater and wife, Sandy, live upstairs. They are persevering against larger competition by emphasizing better service.

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Young customers make obligatory stop at candy counter in Spicer's 5 & 10, a variety store in Ladue, Missouri.

wear out soon if you do?" But in public matters Kresge was generous. He established a foundation in his name in order "to leave the world a better place than I found it." He followed the initial $1 million endowment with subsequent gifts totaling more than $60 million. In 1953 Kresge was asked to give a speech at the Harvard University Graduate School of Business, at the dedication of Kresge Hall. He gave what his son Stanley described as the shortest speech on record there. After being introduced, he stood up and said, "I never made a dime talking"–and sat down. I tell Pete Drinkwater this story as we stand admiring the portrait of the man with the following eyes, and he laughs appreciatively.

It has been the competition with malls, marts and outlets that has figured importantly in the decline of the old-fashioned dime store. A huge Wal-Mart opened recently in Ellsworth, some 30 miles from Winter Harbor, and I ask Drinkwater how it has affected his business. "Well, 30 miles is a long way to drive for a spool of thread," he replies. "I think what people do is drive over there for their big shopping trips but fill in from my store for incidental items. I don't sell a lot of school supplies before school starts, for instance, but after it has been open for a few days, mothers are in here buying pencils and the notebook paper their kids still need. We can't compete on price, but we can give better service."

The Winter Harbor store provides UPS and fax service, ships fresh lobsters to summer residents in their winter homes, repairs bicycles, takes credit cards and offers other services, including running downstairs after hours if a customer has a pressing need. "We've increased sales every year I've been here," Drinkwater says, then adds, "except this last one. But I think that has to do more with the recession than Wal-Mart."

I put the same question about the effect of the new competition to Rick Johnson, a pale, tall young man in his 20s, who for the past year or so has been managing the J. J. Newberry store on Main Street in downtown Ellsworth. Johnson, also a local business-school graduate, worked in four other Newberry's before coming back home to manage this one, where his mother had clerked for years. In a sense, he has grown up in this store. "We're holding our own," he tells me. "People still like to come in here. They like the look of an old-fashioned store. This is a 10,000-square-foot store, not 100,000 feet like the big discounters, and customers tell me they can find things easier here. Seasonal stuff is the biggest part of our business." He points to the Christmas wreaths and decorations with which clerks are beginning to fill one wall. "There's no place," he adds, "that does as well with Memorial Day flowers as we do."

John Josiah Newberry was another of those mercantile Pennsylvanians. Born in 1877 at Sunbury, his first work with dime stores was with S. H. Kress. In 1911, in Stroudsburg, he opened his own store and soon began to open others with his brothers, one of whom, C. T. Newberry, had been superintendent of buyers for Woolworth's. The Newberry chain remained relatively small; in 1954, the year the founder died, it consisted of 475 variety stores with sales of $173 million. In 1973 it was acquired by the Rapid American Corporation, which was in the process of picking up old-time variety stores.

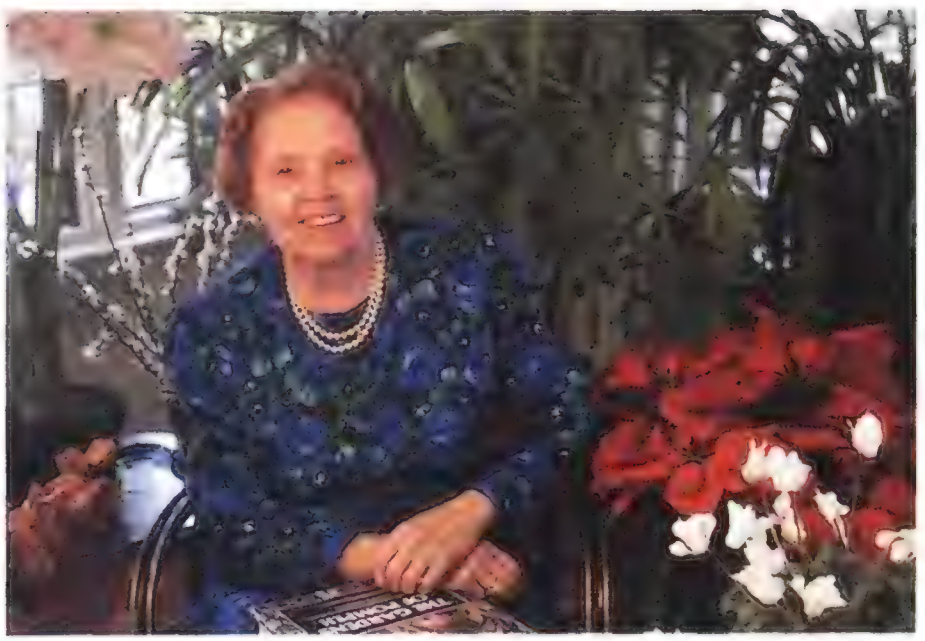
No one at Rapid American could tell me when the Ellsworth store opened. But Vincent Donnell of nearby Franklin knew. "My grandfather, Curtis E. Tracy, built that store," he told me. "Built it in 1934, the year after the big fire destroyed downtown Ellsworth. It was Ellsworth's first five-and-ten. Never had anything like it before."

The place is on three levels ascending the sloped street. Upstairs there are bins of all the usual dime-store goods and, glorious to say, a lunch counter. I belly up to one of the stools, order a grilled cheese sandwich, french fries and coffee. It's my belief that Mary, the cook and waitress, does *not* reuse the grease. She is a motherly-looking woman and would probably be horrified at the very idea. I ask her for a receipt, and she tears off a carton wrapper to write it on. Not many people come here for a business lunch, I guess.

Having satisfied one forbidden childhood yearning, I decide to fulfill another and sashay over to the jewelry counter. Rhinestones are out of fashion, it seems, but I find a pretty pair of dangly silver earrings. They cost $5, not 5 cents, but I buy them anyway. I walk out into the crisp November sunshine. My mood is buoyant, and I notice I am humming the old song by Rose and Fisher.

At J. J. Newberry store in Ellsworth, Maine, grilled cheese sandwich, fries and coffee await a hungry diner.

From a vanished world, images of a green tranquillity



As a pioneer of garden archaeology, Jashemski, here in her sun room, has documented splendid finds such as the painting (opposite) uncovered in Pompeii house.

Wilhelmina Jashemski's investigation of ancient gardens offers an original, moving glimpse into the inner lives of first-century A.D. Romans

One summer evening, in York, Nebraska, a 12-year-old girl stayed up all night, reading. The book she had pulled from the shelves at home that afternoon was *The Last Days of Pompeii*, the classic tale of the thriving port on the Bay of Naples, buried by the eruption of Mount Vesuvius in A.D. 79. "Little did I dream," she would recall years later, "that when grown I would go to Pompeii and myself excavate in that very city."

By the mid-1950s, Wilhelmina Feemster Jashemski, pursuing her career as an ancient historian, did travel to Italy to begin a major research project. She planned a definitive work on the gardens of the Roman Empire: Pompeii, she believed, would yield one chapter in her book. Four decades and an extraordinary life's work later, she is renowned as the author of *The Gardens of Pompeii*, hailed by scholars as "one of the most imaginative and fruitful [projects] in the study of ancient civilization." Volume II, from publisher Aristide D. Caratzas, has just appeared. (Volume I was completed in 1979.)

Some of Volume II's ravishing images, shown here, attest to the breadth of Jashemski's work. In addition to documenting details, from layout to plantings, of the many gardens lying within and without the city's precincts–and in nearby Herculaneum–she has also written the absorbing account of another Pompeian passion: garden painting. In lavish villas and modest houses, people cultivated their gardens. And they adorned the walls enclosing those household plots with renderings of garden vistas–the province, eternally Edenic, of splashing fountains, songbirds and statuary, luxuriantly massed oleander and myrtle, date palm and cherry tree.

In most cases, the photographs of these paintings, many of them taken by Jashemski's late husband, Stanley, preserve a splendor forever lost. For once uncovered and exposed to the elements, the images fade inexorably from existence.

Since the first excavations commenced there in 1748, Pompeii has offered archaeologists a unique opportunity. Lying under the layers of volcanic debris, or lapilli, is an entire city, preserved precisely as it existed at the moment of destruction. Each season, investigators turn up touching evidence of the moment when time stopped: loaves of bread, turned to stone, still lying within the baker's ovens; the skeletal imprint of a faithful watchdog chained at the entrance to its owner's house.

But until Jashemski began her work there, no one had concentrated on the gardens great and small that the citizens of Pompeii had created so lovingly. Collaborating with scholars in fields from botany and ornithology to electron microscopy and palynology (the study of pollen and spores), she has reconstructed with an almost uncanny accuracy the appearance of these vanished gardens.

Her studies have in fact offered passage to an intimate look at the everyday life of ancient Romans. The garden, whether extravagant or humble, was a place close to the heart of every Pompeian. For those sufficiently prosperous, the garden, contained within the walls of a house or villa, was the center of domestic existence. In the forgiving climate of Campania, families virtually lived outside: here they took their meals, women sat in the sun at their looms, children frolicked.

Even the poor managed to cultivate carefully tended plots, allotting precious space behind a shop to a patch of herbs and flowers or, inside a cramped dwelling, adorning a small light well with potted plants. The doomed Pompeians, as Jashemski writes, were indeed a people "who lived surrounded by beauty."

Kathleen Burke

In a modest dwelling known as the House of the Fruit Orchard, many exceptional paintings were found: below images of bull and magpie (right) lie oleander, strawberry tree laden with red fruit.

Luxuriant thicket, adorning a wall in House of the Wedding of Alexander, is planted in lilies, opium poppies, white morning glories.

Humble little house, unnamed, contains this lararium, or household shrine, flanked by serpents and panels depicting flowering shrubs.

Another detail from painting in the recently excavated Wedding of Alexander house depicts exotic bird, likely a purple gallinule.

Painting on rear wall of a minuscule garden conferred elegance on a cramped space: lattice fence encloses graceful fountain.

Forever trilling, a small brown songbird perches on hollow-reed support of thorny stem of a red rose. This detail is also from series of stunning paintings in House of Wedding of Alexander.

Opposite: Gliders with special D-Day invasion stripes kick up dust while landing. Medics (above) use wrecked glider as battlefield aid station.

Kathleen McAuliffe

Crossing the lines on silent wings

D-Day was their finest hour, but all through the war, unsung men of the glider service flew and fought risky and decisive missions

"See this 'G,'" said Earl Shoup, pointing to the letter on the silver Air Force wings fixed to his lapel. "Do you know what that stands for?" His buddies, all sporting the same 'G'-wings, beat him to the punch line: "Guts!" they chimed in unison, their battle cry since their beer-guzzling days back in the service.

Overhead, F-18s swooped in for a 600-mile-per-hour flyby, dazzling the spectators who flocked to the airshow at McChord Air Force Base in Tacoma, Washington. As the rolling thunder of jet engines trailed off to a whisper, an official seized the opportunity to announce the 70 World War II glider pilots gathered as honorary guests at the VIP stand. "Let's give 'em a big round of applause!" he rallied the crowd.

"Gliders! You guys flew gliders in World War II?" The middle-aged Korean War vet couldn't believe his ears.

"Jesus!" boomed a voice from a neighboring bleacher. "I didn't know that–and I was there."

With supersonic warbirds crisscrossing the clouds this fine afternoon five decades after World War II, it was hard to imagine that dinky motorless craft ever set off on death-defying missions into enemy territory. But the men who volunteered to pilot those "flying coffins," to little or no fanfare during the war, have not forgotten.

Though celebrated airborne divisions like the 82d and 101st with whom they served are justly famous, glider men went largely unrecognized. All these decades later they still resent the fact, and they have astonishing tales to tell–of luck, terror, heroism, as well as plenty of snafus, aloft and aground. "We're still swapping lies about it," Shoup told me.

This was long after the fighting. Some old pilots each year inevitably tend to get subtracted from the group, among them Shoup, who died not long after I met him in Tacoma to talk about the glider war. Embellishments aside, glider pilots suffered some of the highest casualties in World War II. As Walter Cronkite, who rode a glider during combat in Europe in 1944 as a young war correspondent, said of the experience: "It was a lifetime cure for constipation."

Although history relegated them to obscurity, glider pilots were at the vanguard of almost every major U.S. engagement of the war: D-Day in Normandy, the Battle of the Bulge, the liberation of Holland, the crossing of the Rhine into Wesel, as well as earlier assaults on Sicily, southern France and even Burma. Their sneak night landings north of Mandalay in 1944-45 kept Japanese troops on the defensive. There were only 6,500 glider pilots in all–a tiny fraction of total Air Force personnel. But they were the only men who both flew aircraft and fought as infantry on the ground.

Glider pilots also pioneered an attack concept called vertical envelopment. After being borne aloft by a towline attached to a powered plane, the pilot would cut loose over the target and silently descend behind the lines in enemy territory where–with luck–his craft could be set down on a back road or a pasture amid grazing cattle, or even in five feet of standing corn. Basically, glider pilots served a function similar to helicopter pilots today–transporting men, fuel, ammunition, Jeeps and medical supplies. Only once down, they were down for good. What they had to do then was fight.

On the ground, the commander in the air suddenly found himself taking orders from members of the airborne division, which typically consisted of about 4,000 glider infantry and 8,000 paratroopers. Scattered all over the landing zone, these mixed units assembled in small bands as best they could and launched attacks against enemy defensive positions to clear the way for the main invasion forces.

Their goal was to knock out artillery batteries and seize bridges, railways and airports. If all went well, the bulk of the Allied army would then join up with the airborne division a few days later, relieving the glider pilots

On D-Day, the 6th of June 1944, two rows of gliders flanked by towplanes line up on a runway in England, ready to take part in the Normandy campaign.

so they could be shipped back to the air bases from which they departed. At least that was how it was supposed to work. But often, former glider pilot Lee G. Hampson noted, "it was like flying a stick of dynamite through the gates of hell."

Imagine, Hampson said, floating at treetop level on "a flimsy, fabric-covered glider loaded with 13 infantrymen or cartons of highly explosive ammunition, gasoline and TNT, through a murderous barrage of heavy flak, and then crash-landing in a tiny field surrounded by 80-foot trees and planted with anti-glider poles. As you crawl out of the wrecked glider you are charged by big tanks and enemy soldiers tossing hand grenades and firing small arms, mortar and machine guns at you."

If flying a glider into combat sounds like a fiendish idea, it should come as no surprise that the scheme was the brainchild of the Führer, Adolf Hitler himself. By early 1940, the German Army had swallowed up Austria and the Sudetenland of Czechoslovakia, and had divided Poland with the Russians. Thus freed on the southern and eastern flanks, Hitler turned his attention to the conquest of Northern Europe. He quickly ruled out a headlong assault on France's Maginot Line.

The obvious solution was to punch past it near the Belgian border and sweep around to the north. But there–in the direct path of his war machine–stood the "impregnable" Belgian fortress of Eben Emael.

Towering over several key bridges at the juncture of the Meuse River with the Albert Canal, Eben Emael stood in the way of the German force set to invade Belgium, Holland and France. The German high command estimated that it would take 6,000 crack ground troops months to seize the heavily armored installation. Unhappy with that timetable, Hitler conceived the daring plan of using a new, and untested, weapon–the glider.

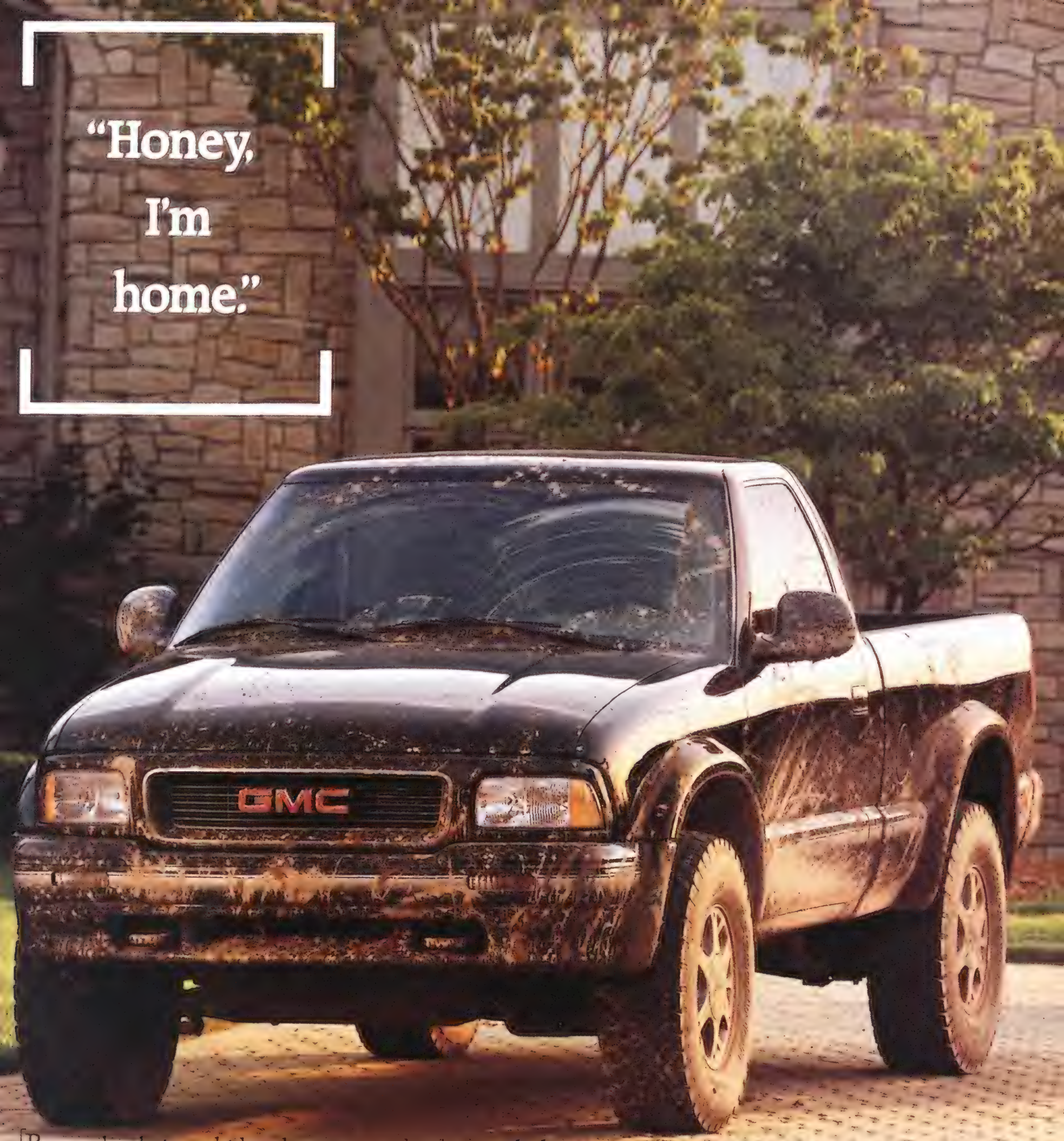
Shortly before dawn on May 10, 1940, in one of the brilliant small tactical feats of the war, ten gliders carrying 78 men landed on the grassy, 1,000-yard-long roof of the fortress. Before stupefied Belgian machine gunners could stop them, the Germans burst out of their gliders and raced to the fort's steel cupolas, which they quickly piled with recently invented 100-pound demolition charges. Even the Germans were stunned by the force of the blast, which tore into the bowels of the fort, incinerating gun crews and other soldiers trapped below. Twenty-eight hours later, the 780-man garrison surrendered. The critical fortress had fallen to Hitler at a cost of only 6 Germans killed and 20 wounded.

Shocked by the news of Eben Emael's devastating defeat, the British raced to develop military gliders. They were followed a year later by the Americans, whose initial reluctance to embrace the idea was rapidly overcome by Pearl Harbor and a second successful glider assault by the Germans during the capture of Crete. The top brass in Washington, however, could never quite decide just what flight qualities a glider should have, or even what exactly a glider group was to do. Eventually, the Army settled on the CG-4A. A boxy prototype designed by the Waco Aircraft Company of Troy, Ohio, it was better suited for hauling cargo than performing the kind of surprise tactical missions the German gliders had pioneered.

It did not inspire confidence in the men expected to pilot it. Resembling a flying crate, the fragile contraption consisted of a fabric-covered tubular steel frame with plywood flooring. With a wingspan of almost 84 feet, it could carry a pilot, copilot and 13 infantrymen. When the human payload was reduced, it could accommodate a 75-millimeter howitzer, a bulldozer or a Jeep. Some CG-4As later flown into Japanese-occupied Burma were even outfitted with mule stalls, since Jeeps were considered unsuitable for mountainous terrain. Mulehands stood by with shotguns ready to dispatch the notoriously cantankerous beasts should they kick up a ruckus in flight, but this proved an unnecessary precaution. The mules took to the air like naturals–leaning against the pitch of the craft and taking the shock of landing often with much more calm than the humans there to pacify them.

The British glider fleet mostly used the Horsa, a craft with almost twice the payload of the CG-4A. They also created the gigantic Hamilcar, which could actually bear a 20-ton tank aloft. These cumbersome contraptions had wing flaps to slow their speed at landing–a feature the CG-4A lacked. Still, they were much less maneuverable, and on rough impact their all-wood frames

Florida freelancer Kathleen McAuliffe writes mostly on science and history, and is not related to the World War II General McAuliffe who said "Nuts!"



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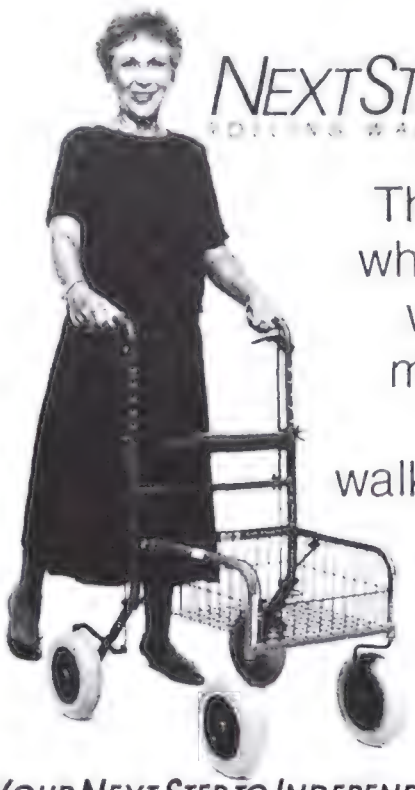

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tended to collapse like a barn in a windstorm, sending deadly splinters in every direction. Most pilots–if given the choice–would take their chances with the CG-4A. "Without a motor, maneuverability was everything," veteran Miles C. Wagner explained. "After all, you couldn't put your foot on the gas and take a second spin around looking for a bigger clearing."

All gliders had a yoke linked to the stabilizers to control up and down motion, and foot pedals that operated a rudder for turning, to provide control in three dimensions. Many pilots compensated for the lack of a gas pedal by using gravity to give them the extra push needed to clear unexpected obstacles. In a maneuver known as a "British blitz," the pilot would push the yoke forward, sending the glider into a nosedive. Sweeping within a few feet of the ground, he would then violently yank the yoke back, using the acceleration from his plummeting descent to hedgehop over fences, trees or any other objects that suddenly appeared in his path.

Such airmanship took considerable mastery; just learning to fly a glider in the first place was difficult enough. For one thing, despite the name, military gliders could scarcely glide, at least in the sense that sailplanes flown by sportsmen did and do. Burdened with their whole 4,060-pound payload, they lost altitude twice as fast as light sport gliders. "For that reason," said Floyd J. Sweet, who headed one U.S. glider instruction program, "early glider training in sports planes turned out to be a poor substitute for the reality of flying a combat glider."

Much of the training was done in California, Texas and other Southern states. Two hundred pilots, volunteers from all branches of the service, were in the first group, with the first class graduating in December 1942. At least half of them went on to become instructors. With CG-4As in short supply, some pilots learned in regular aircraft whose engines were shut down sporadically in midflight–thus intentionally creating an emergency situation dreaded by pilots. Veteran Ed L. Keys: "Today you couldn't pay me enough to shut off the engine of a plane and land in some of the stamp-size South Dakota fields we set those planes down in. You kept your eyeballs peeled and your head on a swivel try-

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Curtiss Commando C-46 towplanes haul double rows of combat gliders. Known as the "flying whale," the C-46 was rarely used in the European theater.

ing to spot the best place for a 'dead-stick' landing. And if you thought daytime landings were bad, think of the paranoia at night."

The situation hardly improved, even when the first gliders had rolled off assembly lines. Much less sturdy than training planes, the CG-4A bounced off the rising thermals "like a brick hitting a wall," as glider pilot Rowell Houghton, a retired lieutenant colonel, put it. During advanced training, the pilots also had to learn a hair-raising "snatch" technique for the retrieval of gliders on the ground. The glider's towline would be strung between two vertical poles in front of it. Then the engine-powered towplane would swoop down with a hook dangling below it on a long line reeled out from a revolving drum. The trick was to snag the horizontal rope and keep flying despite the initial dead-weight shock of the grounded glider you were trying to haul into the air. Within seconds, the tow craft was hurled from a standstill to 120 miles per hour. One glider pilot recalled, "It was a sensation unlike anything I had ever experienced, even on wild carnival rides." In actual combat, it turned out, most gliders were wrecked beyond salvage during their crash landings. If they survived impact, they were often torched by the enemy.

Accidents were common, even in training. The aviation industry was overburdened by the demand for warplanes, so production of gliders often fell to manufacturers with little knowl-

edge of aeronautical engineering. The largest builder–the Ford Motor Company–at least had expertise in mass production. It turned out more than 4,000 of the 13,900 CG-4As made during the war. But many small subcontractors were skilled only at making pianos or wooden ice boxes–or, in one case, pickle barrels. They made serious glitches, many of which weren't discovered until too late. During a demonstration flight at Lambert Field in St. Louis in 1943, a glider built by a local manufacturer lost a wing and fell from the sky, horrifying onlookers and killing more than a half-dozen of the city's prominent leaders who had gone along as passengers. The cause of the crash turned out to be a defective part furnished by a former manufacturer of coffins.

Dirt scooped up during a rough landing pours out of a CG-4A glider, as a Jeep emerges from the hinged cargo bay during combat maneuvers.

Small wonder that the Air Force had to resort to razzle-dazzle recruitment tactics–if not downright lies–to get men to join the glider program. Initially volunteers were required to pass the rigid physical exams given power pilot candidates. They had to be between 18 and 26 years of age and could not have flunked out of a military flying school. But when glowing words in ads like "Soar to Victory" failed to generate a rush on the recruitment office, the Air Force drastically lowered entrance qualifications. "You could be a washed-out cadet, or be as old as 35," one glider pilot said, "or wear thick-lensed glasses–and they'd take you." "We were the bastards nobody wanted," another pilot admitted.

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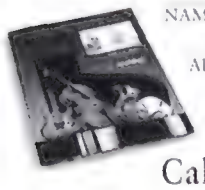

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Adding to a recruitment problem, the first Allied glider mission on the island of Sicily in the summer of 1943 was a fiasco. Glider-borne troops were supposed to take the Ponte Grande, a bridge near the ancient port of Syracuse–and demolish nearby artillery batteries aimed at the shoreline where the amphibious forces of British general Bernard Law Montgomery would be invading the island. On the evening of July 9-10, towplanes hauled 144 gliders–mostly CG-4As–into the sky for the four-hour flight from Africa. In all they carried 1,300 British glider troops and supplies. Ill-prepared for navigating in the dark, many of the towpilots lost their way and mistakenly released their gliders off the coast far from their targets. By daybreak, only 54 gliders had landed in Sicily, only 9 at their designated landing zones. Although Montgomery's forces did eventually secure the bridge, the Allied commanders were appalled to learn that 300 glider troops had drowned at sea.

The tragedy in Sicily, which virtually coincided with the heavily publicized crash at Lambert Field, nearly brought an end to America's glider program. But at the last moment a world-renowned aerial stuntman, Mike Murphy of Findlay, Ohio, orchestrated a Hollywood-style demonstration that won over even the severest critics of the program.

As a high-ranking glider officer, Murphy escorted a team of top Air Force commanders to a bleacher in the middle of the training field at the Laurinburg-Maxton Army Air Base in North Carolina. It was dusk. Unbeknownst to the Air Force brass in attendance, more than a mile away a fleet of CG-4As were getting ready to release from their towplanes. When dusk had deepened, making it almost pitch-black outside, Murphy's voice, as he gave a short talk on the virtues of combat gliders, was booming out of the loudspeaker. The gliders were then approaching the field, but Murphy's amplified voice successfully concealed the muffled thumps and whine of skids as the planes touched down directly in front

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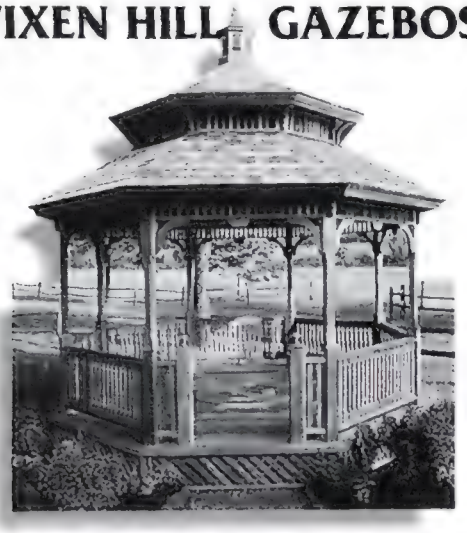

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Deadly crash in 1943 almost ended the combat glider program in the USA.

of the bleachers. Murphy yelled "Lights!" and to the amazement of the unsuspecting audience, there were ten menacing-looking gliders directly in front of them.

Thus converted, the military went ahead in many theaters of the war, where, through trial and error, they learned the terrain and conditions in which motorless aircraft could be used to the best advantage. Night missions gradually were phased out–the damage from crashes proved worse than enemy fire in the broad light of day–and much greater care was given to the preparation of pilots. Before the invasion of Normandy in June 1944, for instance, the men spent hours studying three-dimensional maps of the landing area, memorizing the terrain, the layout of houses and even the names of the farmers who occupied them.

In many ways that invasion was glider command's bravest hour. The top-secret mission called for the deployment of 1,200 American CG-4As and 300 British Horsa gliders. They were to strike early in the dark dawn of D-Day, June 6, 1944–some five hours before

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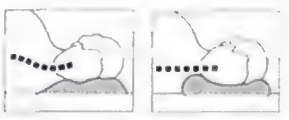

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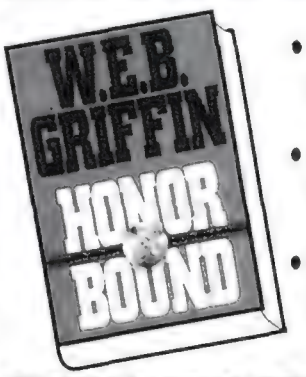

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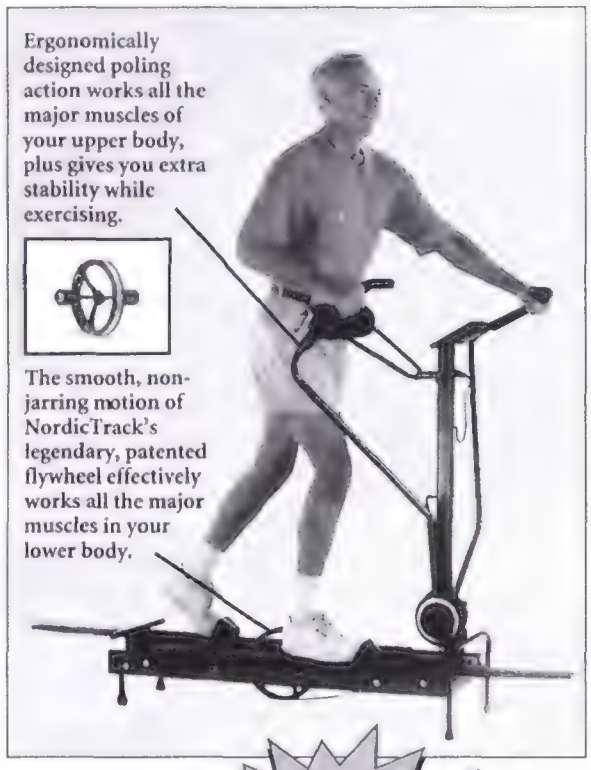
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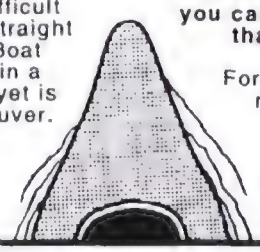

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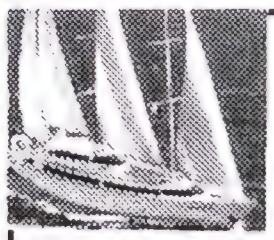

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the amphibious assault troops hit the beaches. From various airfields in England, gliders and paratroop carriers brought three full airborne divisions several miles behind Nazi lines at points near Ste. Mère-Eglise, Carentan and Caen. Their task was to touch down on opposite ends of the Allies' wide Normandy beachhead and seize control of key bridges and roads to protect the landing troops from early counterattack.

In case they were caught behind enemy lines, glider pilots, like other pilots, were given an escape packet that included a photograph ID in civilian clothes, along with a foreign alias. Lennie Williams, who flew into Ste. Mère-Eglise on D-Day, was glad to report that thanks to his comprehensive briefing, he did have an intense sensation of déjà vu coming in to land. "I felt as if I was driving through my own farm," he recalled. "It was unbelievable. I knew where everything was–every tree, every fence, every house and the names of the occupants, to boot."

Intelligence information sometimes proved dangerously faulty, though. Trees in Normandy said to be 20 feet tall in fact towered to 80 feet. Hedgerows, which the pilots were told to plow through in an emergency, often

Ex-stunt pilot Michael Murphy saved glider program with a surprise night mission.

This combat glider has delivered troops even with its wings badly chewed up by "Rommel's asparagus"–stakes set to sabotage the airborne landings.

hid centuries-old stone walls. Men who hit them paid for it with their lives.

Even in the air–especially in the air, some pilots would say–gliders were never really reliable. Many simply disintegrated in turbulent skies. On hitting a downdraft over the English Channel, one of Britain's behemoth Hamilcar gliders dropped a tank through the floor, sending the tank and its crew to a watery grave. Approaching a crowded landing zone during the invasion of southern France later in June, a glider pilot was astounded to see a Jeep tumbling down from the sky–testimony to one of many midair collisions.

Landing was often a nightmare. Because the Nazis feared surprise landings, fields were flooded or impaled with the infamous anti-glider poles unaffectionately known as "Rommel's asparagus." Usually 12 feet tall, they were arranged in long rows 15 to 40 feet apart and tied together by wires, which when hit were intended to activate mines planted at their bases. Fortunately, the Germans rarely found time to fuse the mines. What's more, in their methodical zeal they often planted the posts at too-regular intervals. By shearing off the wings of his craft, a skilled or just lucky glider pilot sometimes brought down the plane more or less intact–amid a field of stakes!

Of course, those who survived hedgerows, flying Jeeps and Rommel's asparagus had to worry about enemy fire. As they neared the landing zone, the pilots were terrified of groundfire shooting up through their legs–and often placed their helmets in a strategic position. Although parachutes were routinely issued to fighter and bomber pilots, no such luxury was afforded the glider pilot. According to Gerard Devlin, aviation historian and author of a book on glider pilots, "The 13 infantrymen in the back of the glider had to do without them because of the excessive weight. Given the circumstances, a pilot wearing a chute would have been looked upon most unkindly."

With no way of bailing out, some pilots broke the rules and took additional protective measures against groundfire. Before the massive airborne invasion of Wesel, Germany, the morning of March 24, 1945, Earl Shoup fitted a piece of armor-metal plating to the floor under his feet. The mission, establishing a bridgehead on the far side of the Rhine, involved a staggering number of aircraft–1,346 gliders and 1,591 power planes. But less than 20 miles from Wesel, in an elevated and heavily forested area, 50,000 German troops–including several panzer divisions–stood guard with an estimated 100 tanks, self-propelled guns and a large number of antiaircraft weapons. The heavy armor plating was strictly against regulations. But Shoup had no apologies. In the last few minutes of flight, the plate bounced up from the floor, thrusting his knees toward his chin, three times in a row–

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each one the result of a direct enemy hit.

Although Shoup came through unscathed, his glider did not. A phosphorus shell set one fabric-covered wing on fire, and while descending through the smoke screen for an emergency landing, Shoup suddenly caught sight of high-tension power lines. "We'd been taught to go over the power lines," he told me, "but in a situation like that, who the hell cares! I slipped her right under and landed in a big field."

Many glider pilots were not so fortunate. Severely injured by groundfire during the invasion of Holland in September 1944, George F. Brennan holds the distinction of being the only man to crash-land a fiery glider with just one hand, one leg and one eye–and live to tell about it. Miraculously, he brought the crippled glider to rest in a small field, where the burly Irishman and a passenger managed to crawl into a ditch. There, they opened fire, killing or wounding a patrol of a dozen or more Germans who came to scavenge supplies from the burned-out wreck in which they assumed no one had survived. Eventually, a farmer in the Dutch Resistance came to their rescue and transported them–hidden under a pile of hot manure in a creaky two-wheeled cart–to a Catholic hospital. There Brennan's body was bandaged like a mummy. The Sisters put him in a maternity ward and placed pillows on his belly to make him look like one of the many pregnant women. The ruse worked long enough for him

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Before taking off for a cross-Channel glider assault, some British airborne troops help boost morale of folks back home with thumbs-up sign.

to survive–even though, Brennan chuckled, "I never did deliver."

Just as vivid as these moments of terror were the cheering welcomes crews received from residents of Nazi-occupied Europe, many of whom first learned of their impending liberation when they heard the bewildering thud of a glider crash-landing practically on their doorsteps. On D-Day, an innkeeper in Bénouville, Normandy, awoke to just such a bang in the night. The man, Georges Gondrée, fled with his family to the cellar, but on hearing conversation overhead that lacked the guttural sounds of German, he finally summoned the courage to climb upstairs and confront two men with coal-black faces. "It's all right chum," they said. Overjoyed at hearing English, Gondrée burst into tears. Soon his wife and children were kissing the soldiers, becoming coated in black camouflage paint in the process. By daylight, a small detachment of glider troops overwhelmed German defenses at nearby Pegasus Bridge, a critical objective for the success of the entire Normandy invasion. To celebrate, the innkeeper began uncorking 98 bottles of champagne prudently kept hidden for just such an auspicious occasion.

Captured during the invasion of Holland, American pilot Marion Case may have received the most emotional welcome of any glider pilot during the war. Case arrived as a prisoner under guard at a war camp in Germany just after the Red Cross had completed an inspection to verify that the POWs were not being tortured or mistreated, in compliance with the Geneva Convention. While being hustled through the barbed-wire enclosure by a gauntlet of SS guards with snarling German shepherds, Case spotted the emaciated inmates–mostly Frenchmen–devouring chocolate bars distributed by the Red Cross. Suddenly someone pointed to the American flag on Case's sleeve, and riotous elation swept through the camp: at long last, here was living proof of the much-rumored arrival of American troops in Europe.

The starving men showered Case and the other captives in his group with their candy bars. The guards yelled "Halt!" But like the ticker tape in a parade, the candy bars continued to rain down on the American pilots. The Germans opened fire, killing two of the French prisoners at point-blank

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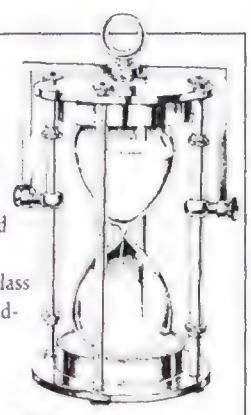

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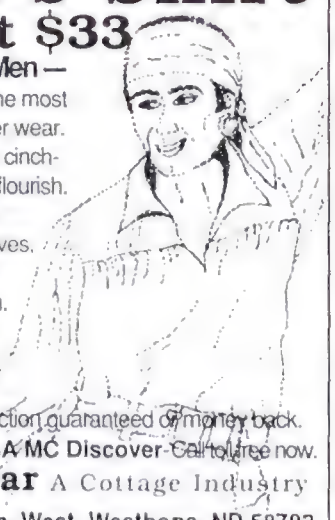

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range. Still the candy bars kept coming. "We screamed 'Stop! Stop!' and finally they stopped," said Case, who 50 years afterward still flinches recalling this suicidal act of defiance.

Glider pilots made up far less than 1 percent of American military personnel in World War II, and the "bastards nobody wanted" are understandably piqued that the general public has still barely heard of them. Their many heroic deeds have gone unrecognized even within the military.

On December 26-27, 1944, for example, American glider pilots braved intense enemy fire to come to the aid of the surrounded troops of Brig. Gen. Anthony C. McAuliffe during the Battle of the Bulge. When the Germans demanded that he surrender or be annihilated, McAuliffe gained fame by replying "Nuts!" But despite his display of bravado there was precious little gasoline, and nearly 500 badly wounded U.S. parachute and glider troops were in desperate need of treatment. With Gen. George S. Patton's troops still hours away from a chance of breaking the German grip, glider pilots flew to the rescue, delivering surgical teams and gasoline through a blinding barrage of flak. Many pilots were wounded or killed. Their effort earned them little more than a pat on the back, while some of the medical officers they brought in ended up with individual decorations.

The men each have their own pet theory to account for this and other enduring snubs. "We fell through the cracks," said Brennan, who is still painfully crippled from his war injuries. "When we hit the tow release, we severed our administrative umbilical cord to the Air Corps. So you had this crazy situation in which the Air Corps thought the Army would be handing out the decorations, while the Army, in turn, thought the Air Corps would be taking care of us." Gerard Devlin blames the "mindset" of Air Force officials. "In their attitude," he says, "if you didn't fly a plane that could shoot down another aircraft or bomb somebody to oblivion, you

weren't a real man." Indeed, out of eight thick volumes that the Air Force produced on its role in World War II, fewer than three pages are devoted to glider pilots.

This oversight notwithstanding, the old boys looked like a happy crew–as cocky and irreverent as ever–back at a motel bar after the airshow. Many still fly sailplanes and power planes for fun. And although the combat glider was eclipsed by the helicopter in the 1950s, the vets have been cheering its comeback in the guise of the modern space shuttle, which they are quick to remind everyone, *lands* without engine power. They had an especially good laugh over an autographed photograph that three astronauts sent to the glider pilot association. Penned across the top was the message: "At least the natives were friendly where we landed."

In September 1944 Dutch villagers and a policeman watch gliders carrying units of the 82d Airborne Division toward a target behind the German lines.

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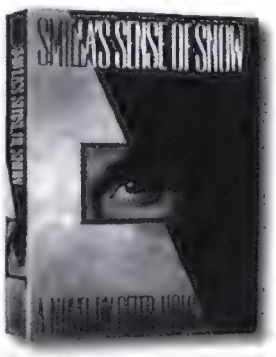

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Book reviews

Tales of a Shaman's Apprentice
Mark Plotkin
Viking, $22

First I have to come clean. Mark Plotkin, author of this book I'm about to review, was the subject of a piece in this magazine a few years ago written by–you guessed it–*moi* (SMITHSONIAN, February 1989). We spent a week together in a village in the Amazon rain forest, in Suriname, trekking jungle paths with Tirió Indians as he gathered information on medicinal plants. For Plotkin, a Harvard-trained ethnobotanist and vice president of Conservation International, this was just another week at the office. It was what he does regularly in his campaign to preserve tribal medical lore and in so doing help preserve the rain forest, an effort he chronicles in this book.

That trip was my first visit to a society where men wore breechcloths, hunted with bows and arrows, and believed that they could transform themselves into animals. Every day brought astonishing new experiences, and Mark was a skilled and subtle intermediary between me and the Tiriós. My piece praised him and his work, and it helped lead to this book. So if you seek detachment and objectivity here, you'd better seek elsewhere. Mark and I have another connection that is borderline spooky: his brother Norman, a lawyer in San Francisco, works for my brother Allen. Neither of us knew this when we met.

With that bias on record, I can say that what is most surprising about this book is its literary quality. Plotkin comes from the world of scientific journal articles, where clarity is often an afterthought, but here he shows a fine eye and a gift for language. He sees everything fresh, and he's as good at describing people as

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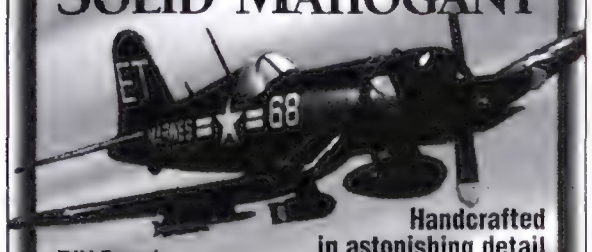

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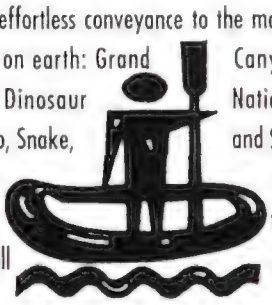

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he is with plants, which is good indeed. Watching a shaman who seemed more than a little mad perform a healing ceremony, Plotkin writes "looking at that shaman was like staring into a roaring fire at close range." He describes another old medicine man who can't quite summon his powers anymore: he "squatted on his haunches and turned to face the sun like some primeval bird trying to absorb enough solar energy to make one last flight."

Plotkin works with a number of tribes in the part of northern South America where Brazil, Venezuela and Suriname intersect. More than a decade ago he took as his assignment the gathering of the ethnobotanical knowledge held by these tribes before both the shamans and their forest home become extinct. The task calls for cultural sensitivity, an aversion to condescension and easy judgments–and a sense of humor.

He is willing to shed the baggage of Western culture and approach "primitive" people as student rather than teacher–a lesson he learned from his mentor, Richard Schultes, at Harvard. On one early trip he had a dream in which a jaguar entered his hut. When the man Plotkin calls the Jaguar Shaman learned of the dream, he smiled and explained, "That was me." To Plotkin, this was an instant of pure enlightenment. "It became totally clear to me," he writes, "that different people, cultures and places can have their own realities, that just as one can learn the spoken language of a foreign land, one can absorb its spirit–even if that spirit and its wisdom differ radically from those of one's own culture. In a society where people believe that hallucinogenic experiences are caused by deities that inhabit sacred plants . . . why shouldn't a medicine man be able to turn himself into a mighty jungle beast?"

Ever humble in the face of his rain-forest mentors, Plotkin has been able to learn even the most closely held secrets. Take, for instance, his introduction to the preparation of poisonous hunting compounds. Finally, one medicine man took Plotkin deep into the forest to instruct him in this deadly art. As the old man added each ingredient to his lethal potion, he explained the effect of each element on a victim. Sometimes, the shaman pointed out, the addition of large stinging ants to the mixture could render the poison even more virulent. "Once again," Plotkin writes, "indige-

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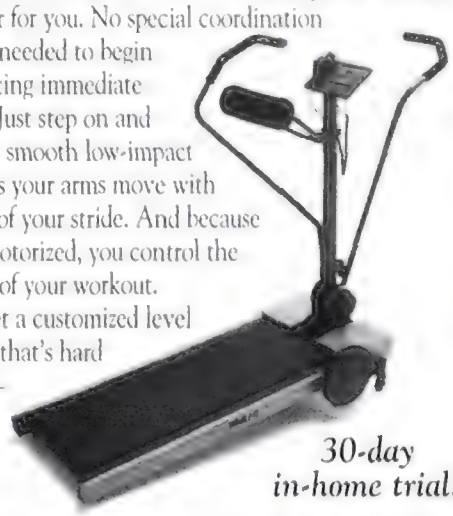

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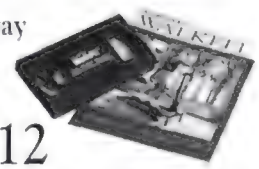

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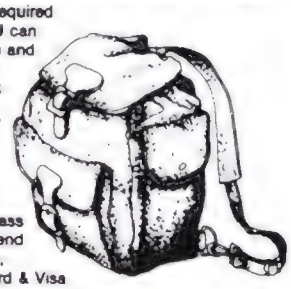

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nous peoples in red breechcloths had proven to be our equals–actually our betters–in organic chemistry."

Plotkin artfully mixes narrations of his expeditions with scientific and cultural information, everything from a capsule history of the spice trade to the story of how the Mexican general Santa Anna introduced chewing gum into North America. The message he repeatedly returns to is that–after the required testing–Western adoption of jungle medicines would be a boon for us, for the peoples of the Amazon (assuming they receive royalties) and for the rain forest, since it would provide an economic rationale for conservation. Only rarely does the text lapse into a workbook for Ecology I, but Plotkin has too much humor and insight to allow that to persist for long.

Though he is an explorer, Plotkin is refreshingly devoid of Tarzan delusions. This is an explorer who doesn't mind looking silly. He is a city boy, son of a New Orleans shoe salesman, and he sometimes looks and sounds like one. On a trip to French Guiana in search of the huge and menacing black caiman (one of the book's best chapters), he almost overturns a boat when he panics and mistakes the red lantern on a fishing boat for the implacable eye of a floating caiman. A shaman in the village of Kwamalasamoetoe, where I traveled with him, collapsed in giggles whenever he saw Plotkin, whom he called "white-man-who-falls-on-his-ass" because of the time Mark did just that in a stream. When introduced to another shaman, the man patted the hair on Plotkin's chest and uttered a word Mark later learned meant "spider monkey."

Stamina is his long suit. I remember stumbling along behind him and marveling at how he could keep up with the Indians. When I had to bail out at one point, Mark and the Indians conferred and decided that a guide would escort me back to the village. If I waited in a clearing as I wanted to do, they explained, a jaguar might show up, "and all we'd find would be your notes."

With scholarly discipline overlaying a happy-go-lucky New Orleans personality, Plotkin may be the ideal scientist for the job he's chosen. Except for one thing, and he never came clean with me about this. In airplanes, I noticed, whenever we took off or landed–and we had some memorably rocky comings and goings–he became extraordinarily quiet, bowed his head and seemed to be in prayer. When I mentioned this he refused to discuss it. You're not jittery about flying, are you, Mark?

Donald Dale Jackson is a freelancer who writes from rural Connecticut.

The Evening Star: Venus Observed
Henry S.F. Cooper jr.
Farrar Straus Giroux, $22

Just 30 years ago, we knew well only one planet, our own. Today, we are familiar with all of Earth's eight siblings in the Solar System, except icy Pluto. This rapid expansion of human horizons came about thanks to an array of unmanned spacecraft–Pioneers and Mariners, Vikings and Voyagers–that traversed interplanetary space and relayed back to Earth startling pictures and other data of distant worlds. The Magellan probe, which started mapping Venus from its orbit in August 1990, is among the last space missions of this classic era of planetary exploration.

In *The Evening Star*, Henry S.F. Cooper jr., veteran science reporter for the *New Yorker*, expertly chronicles the fantastic voyage of Magellan and the human drama of excited scientists awaiting its radar images.

The brightest object in the night sky after the Moon, Venus has captivated human minds since antiquity. Named after the goddess of love, it is often described as Earth's twin because the two planets are so similar in size, density, composition and distance from the Sun. Naturally, many scientists and writers–Sir William Herschel and novelist Edgar Rice Burroughs among them–believed that it might be a suitable haven for life. But the space probes that visited Venus in the 1970s unfolded a very different story–a planet with a surface temperature of 900 degrees F, a surface pressure 90 times that of Earth's at sea level, and a carbon-dioxide atmosphere that illustrates our worst fears about the greenhouse effect.

Why did the evolutionary pathways of Earth and Venus diverge so much? Cooper recounts the excitement and frustration of scientists as they seek to answer that all-important question with Magellan's help. He shares the joys and fears of the engineers who try to keep the spacecraft alive throughout its long and perilous journey.

Although, unlike the Apollo missions to the Moon, Magellan has no astronauts on board, Cooper gives the spacecraft a personality of its own. "Magellan looked like a surrealistic bug, sculpted perhaps by Joan Miró–not a bee, exactly, or a mosquito, or a water beetle, but a little like all three. It was rather squat and inelegant, compared to the graceful Voyagers with their long filigreed booms, true dragonflies of space." In fact, Cooper goes on to describe Magellan's sophisticated machinery in such exquisite detail that a reader comes to care about the spacecraft as if it were a living thing; he even talks of the craft's "heartbeat" and the real danger of a "sort of nervous collapse" or a "coronary thrombosis."

When Magellan's radio signal to Earth dies without warning on several occasions, the suspense that cloaks the Jet Propulsion Laboratory in Pasadena, California–the mission control center–is chilling. Yet, as Cooper points out, "the dangers to a mission lie as much in Washington (where budget cuts can be deadly) as in space."

As the radar maps of Venus appeared on JPL computers, the scientists began to debate what the images really meant. Some started counting craters, hoping to estimate the age of the Venusian surface; the older the surface, the more craters one should find. Others concentrated on more curious features that had the shapes of pancakes or horseshoes. Yet others wondered about the role of volcanoes in the planet's geological history. Cooper leads the reader through this beehive of activity, a keenly observant, ever-able guide.

One of the key issues resolved by Magellan was that of "plate tectonics" on Venus. Earth's crust is divided into many sliding plates that are driven by the heat flow from the planet's interior. Where these plates run into one another, mountain ranges form. Several scientists expected Venus to follow suit. But Magellan data suggest that Venus' crust isn't stiff enough to slide around in large, intact pieces. Instead, as heat from the planet's interior tries to escape, the Venusian crust wrinkles and puckers pretty much in place. How the pieces of this puzzle came together is a fascinating story with a memorable cast.

For all its drama, *The Evening Star* is more than a (robotic) traveler's tale. It is an absorbing account of the science of Venus, which we are just beginning to understand, and which might tell us something important about the future of our own fragile world.

Ray Jayawardhana is the former editor in chief of *Yale Scientific*.

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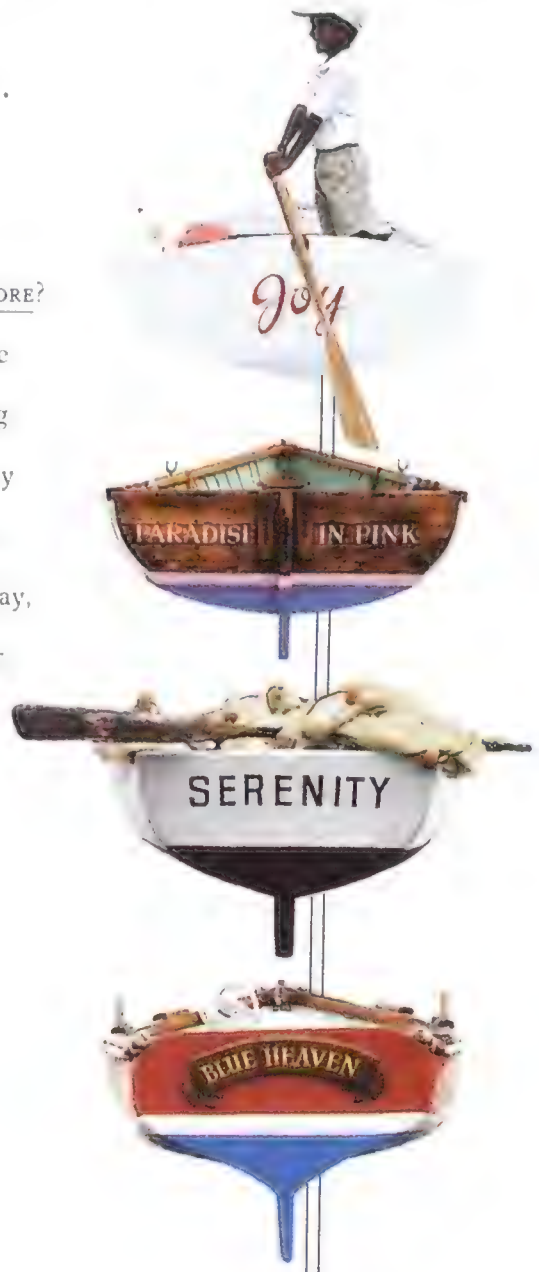

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Additional reading

Wolves (p. 34)

"The call of the wild: Part I" by Eve Marar, *Dog World*, September 1993

"The call of the wild: Part II" by Eve Marar, *Dog World*, October 1993

"Wolves at the Door" by Amy Linn, *Philadelphia Inquirer Magazine*, December 1991

"Of Wolves, wolf hybrids and children" by Monty Sloan, *Latham Letter*, Latham Foundation for Humane Education (Alameda, California), Summer 1991

The Wolf Hybrid by Dorothy Prendergast, Rudelhaus Enterprises (Gallup, New Mexico), 1989

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Horace Pippin (p. 48)

I Tell My Heart: The Art of Horace Pippin by Judith E. Stein, Pennsylvania Academy of the Fine Arts, 1993

A History of African-American Artists by Romare Bearden and Harry Henderson, Pantheon Books, 1993

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Comet collision (p. 62)

Comets: A Chronological History of Observation, Science, Myth, and Folklore by Donald K. Yeomans, John Wiley & Sons, 1991

The Quest for Comets: An Explosive Trail of Beauty and Danger by David H. Levy, Plenum Press, 1994

"Stop to Consider the Stones That Fall From the Sky" by James Trefil, SMITHSONIAN, September 1989

Mountain bikes (p. 74)

Richard's Mountain Bike Book by Charles Kelly and Nick Crane, Ballantine, 1988

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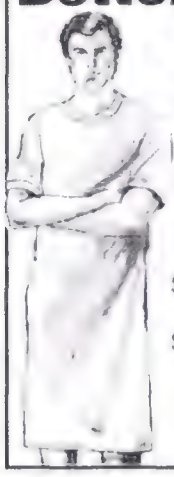

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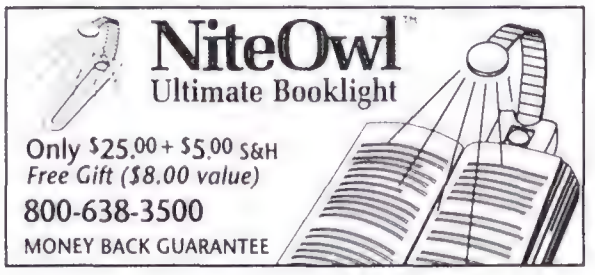

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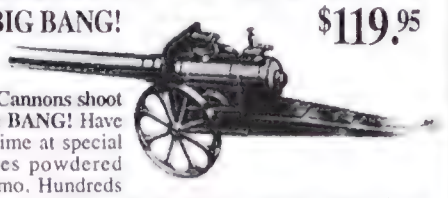

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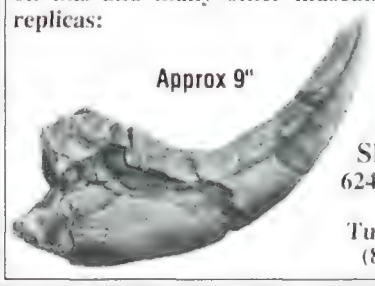

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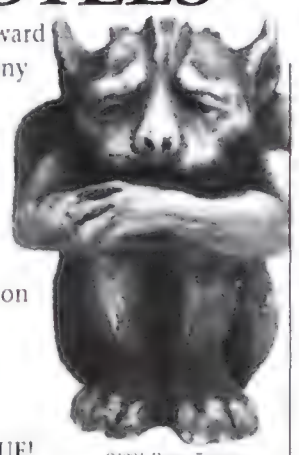

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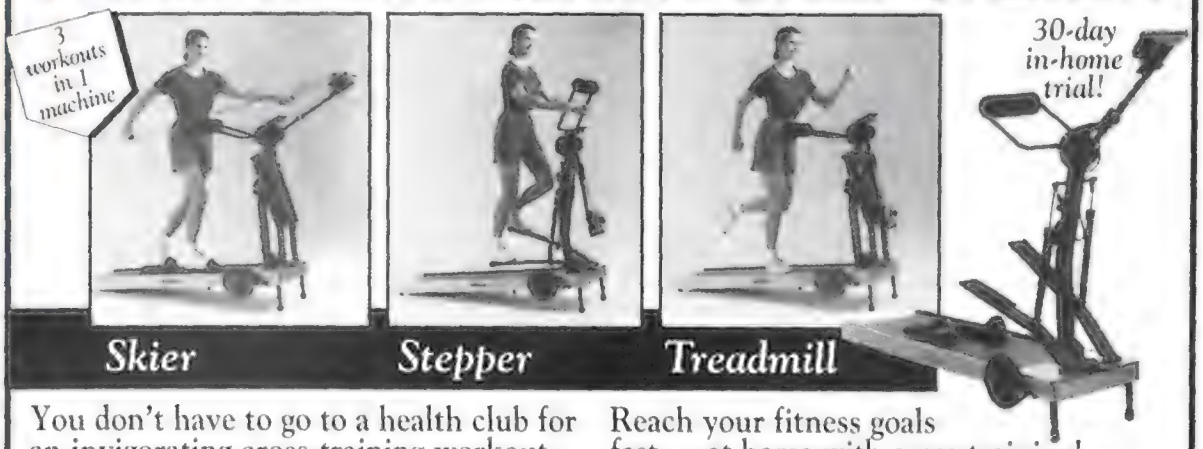

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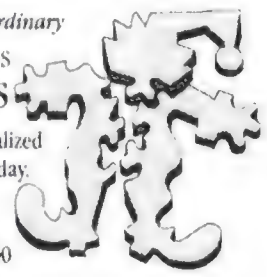

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By Bailey White

Amid produce and piety, Mr. Grange has Idaho on his mind

For Dust Thou Art And Unto Dust
Shalt Thou Return
plums peaches watermelon

That's the message on the flashing-arrow sign outside Mr. Grange's roadside fruit and vegetable stand today. It's summer. Cantaloupes and Persian melons are piled high in bins, and ripening peaches are spread out on the shelves. There's a smell of mangoes and greengage plums, and everywhere there are the colors of rose and green and gold. Mr. Grange is religious. His serious, dark eyes peering out of the shadow under the brim of his Snap-On-Tools cap look like Noah's eyes must have looked when he searched the horizon for that first sight of land.

Mr. Grange is looking for someone from Idaho. On the back wall of the produce shed hangs a schoolroom map of the continental United States. Every time new customers come in, Mr. Grange finds out where they are from. Then he sticks a tack in the map in that state. Tacks cover the states of Georgia, Alabama, South Carolina and Florida like the scales of a reptile. There are two tacks in Maine, four in California. So far there is not a single tack in the state of Idaho.

Mr. Grange lurks like a big spider in the deep shade at the back of the produce stand beside the watermelons and glowers out from under his cap. A car pulls up. A woman gets out. She clutches her pocketbook and squints into the shadows. She takes a few tentative steps.

"Idaho?" asks Mr. Grange.

It's October. The flashing sign outside Mr. Grange's produce stand says:

Yea, Though I Walk Through The
Valley of the Shadow of Death
I Will Fear No Evil
pumpkins pomegranates persimmons
cane juice

Mr. Grange likes to make decorations that reflect the season. Today he is making skeletons for Halloween. He cuts up bleached gourds to be the skulls, and he makes bones out of ash twigs and then wires them together.

The finished skeletons flop around festively in the cool, fall breeze under the eaves of the fruit stand. Mr. Grange's lap is full of bones.

In the background there's the steady *clank clank* of the cane grinder, and a trickle of brown juice and scum flows from the spigot into gallon-size plastic jugs. Crocus sacks of pecans slump against each other in the middle of the floor. Pumpkins are piled up in every corner, and sheaves of sugarcane stalks and shocks of Indian corn lean against the wall.

Produce men stop by. There are apple men from the mountains, pecan men from the Piedmont and citrus men from central Florida. They stand around and talk produce and eat boiled peanuts. But Mr. Grange is taciturn. He silently bends ribs and drills holes in ash femurs with an auger.

By the end of October the last of the pumpkins have been sold, and almost no one comes to the produce stand anymore. Mr. Grange sits patiently in his aluminum chair out in the sun. He is philosophical. In Idaho, in the fall, everyone stays at home.

It's a cold, gray day in February. The sign says:

The Lord Giveth And The Lord
Taketh Away
Blessed Be The Name Of The Lord
collards onions

Most of the wooden shelves in the produce stand are bare. There are a few shriveled potatoes in the bottom of a bin and a couple of scrawny bundles of collard greens, bitten by the freeze. A bitter wind is whipping across the seared fields and rattling the bristly pastures behind the produce stand.

Mr. Grange sits bundled up in his aluminum chair and cuts snowflakes out of lined notebook paper. He hangs the snowflakes from the rafters on lengths of baling twine. Another piece of notebook paper is taped to the wall with a message written in blue ball-point pen: "Winter Wonderland."

Spring has arrived at last. Mr. Grange's sign says:

I Will Lift Up Mine Eyes Unto The Hills
My Help Cometh From The Lord
asparagus jelly rhubarb

Sugar snap peas glisten in their baskets, and bowls of Mayhaws gleam like rubies. Mr. Grange has taken down the drooping, notebook-paper snowflakes and is cutting bunnies out of freezer paper folded accordion-style. His big, rough hands snip and snip: ears, a tail, back legs. Finally he stops cutting and separates the bunnies. The row spreads out, flops; he stretches it wide, and there they are, 15 leaping bunnies, each with one hind foot connected to the front foot of the next bunny.

Mr. Grange doesn't smile. In his slow, workmanlike way he takes a pink crayon and colors the nose on every bunny. A gentle breeze blows out of the west. In the field behind the produce stand the corn is up. The first peaches will soon be in. Mr. Grange gets out his big map and wipes off the dust. He gets out his box of tacks. He sets his aluminum folding chair out in the sun. And way across the land, across fields and woods and towns and rivers and lakes, in Idaho, the travelers begin to stir.

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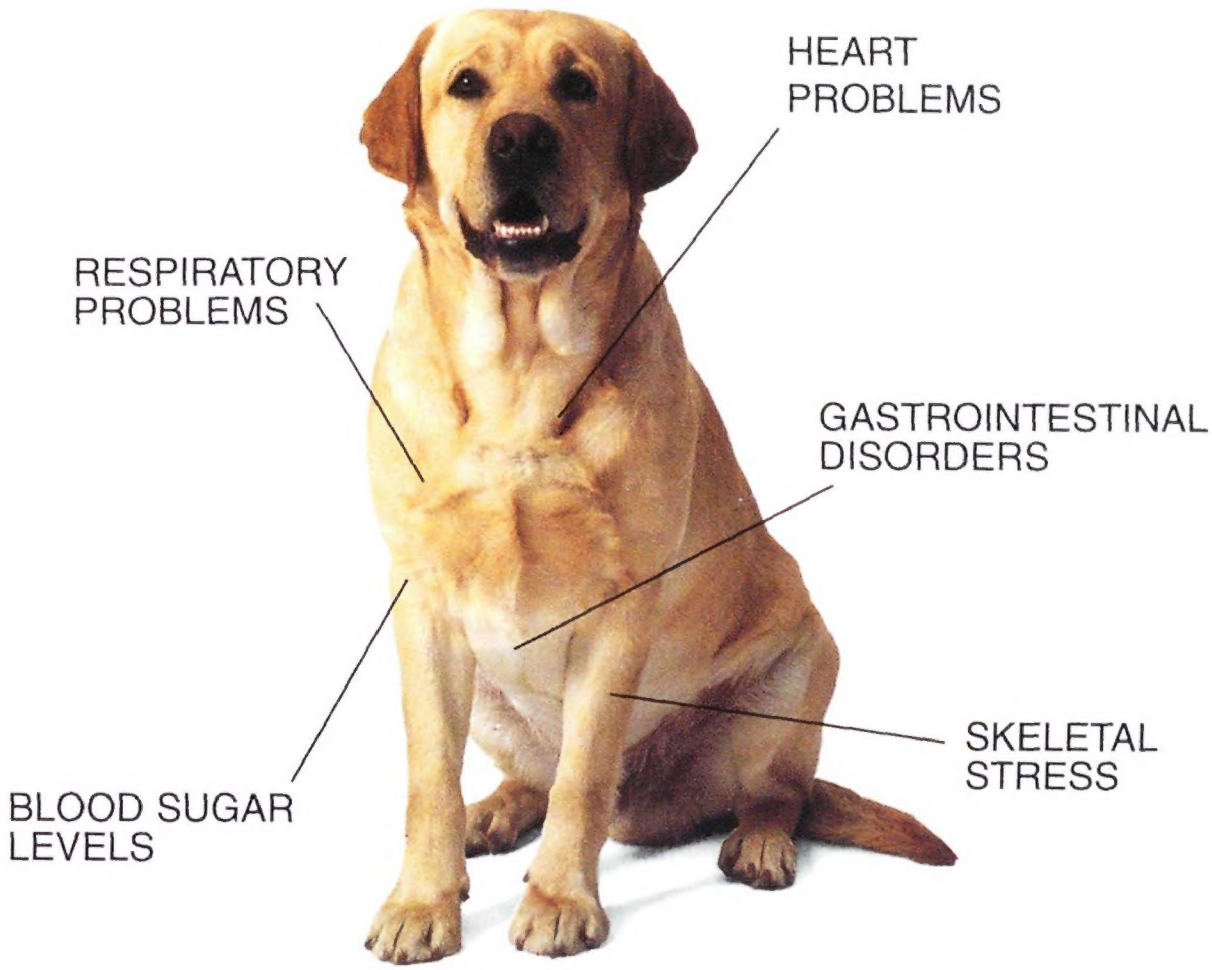

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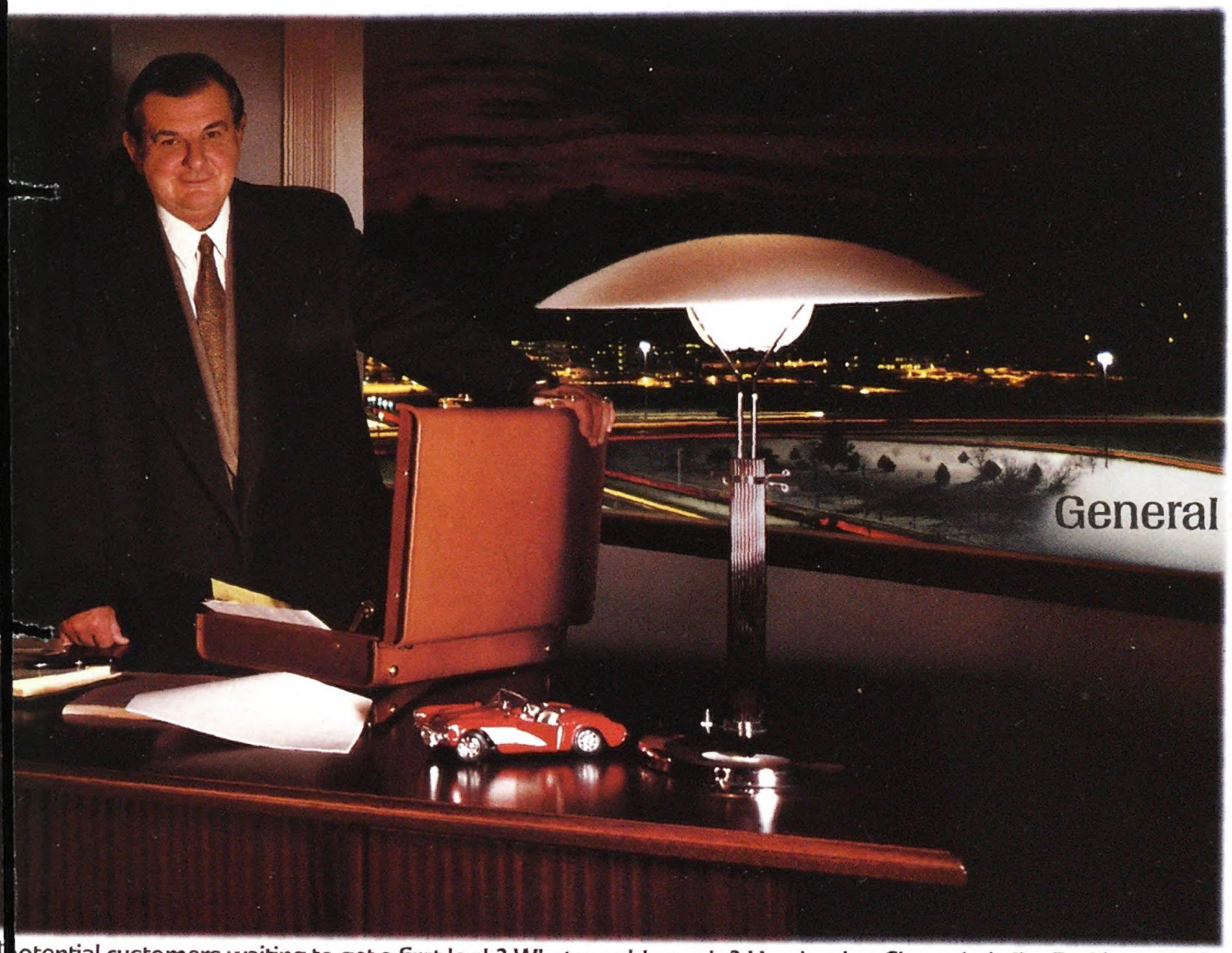
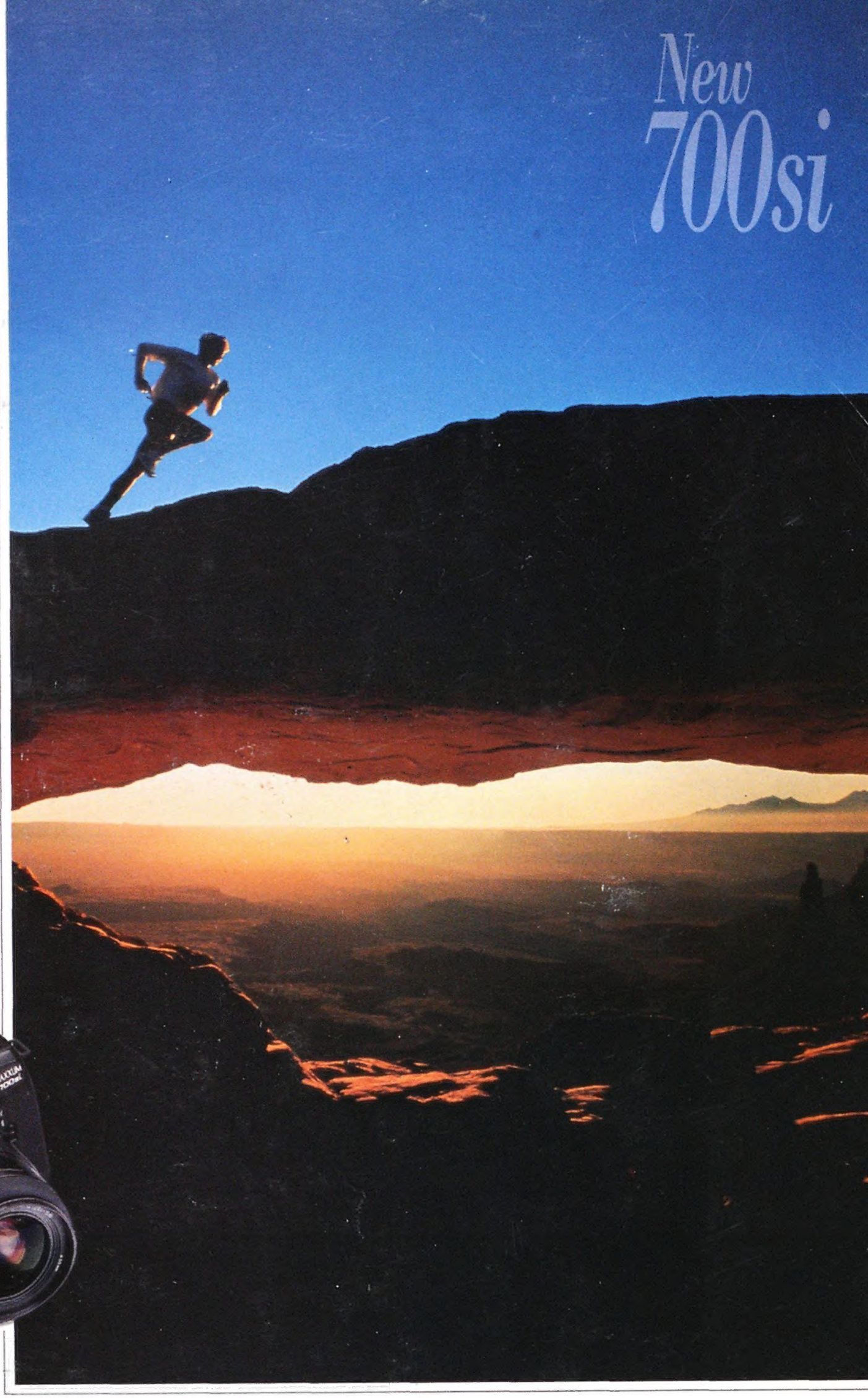
and we did the Right thing."



otential customers waiting to get a first look? What would you do? Here's what Chevrolet's Jim Perkins and his eam did: they pulled the plug on the introduction and said, "When we know we've got it right, we'll bring out the ar." That night, Jim Perkins did what people who do the right thing always do. He got a good night's sleep.

State of the art is our state of mind.



At Minolta, we define state of the art as the point where you have total control of your own personal vision.

Minolta's new 700si is one of the most intuitive, precise SLR's ever. It thinks and reacts like a serious photographer. With Expert Intelligence and honeycomb metering, it

evaluates your shot, then chooses the perfect exposure—even for landscapes or high-contrast scenes. Its autofocus is the most sensitive yet on any Maxxum®—so sensitive it can even focus on a cloud. Plus, the optional 5400 HS flash gives you the world's fastest sync speed of up to 1/8000 second.

Feedback pops up automatically in the viewfinder, yet final creative judgment is up to you. Because the 700si lets you switch effortlessly from automatic to manual, with the finesse of a fine sports car. You can even access your own personalized settings with the memory function.

At Minolta, our state of mind was to create a truly interactive camera that gives *you* total control and total creative freedom. And that's what makes the 700si state of the art.

For more information write: Minolta Corp., Dept. CR-19, 101 Williams Drive, Ramsey, NJ 07446.
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